SCIENCE TEACHERS' PRACTICES AND THE USE OF RESOURCE MATERIALS IN TEACHING SCIENCE IN YEAR EIGHT CLASSES IN SAMOA

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ABSTRACT

Education in Samoa requires good quality teachers to increase students' knowledge, skills and understanding of the world in which they live in. The most common way for assessing students' proficiency is through formal examinations. In Samoa, the results of national examinations are used to select teachers for promotion, certification and placement. One major concern of teachers as well as parents in primary schools is that the results of the Year 8 National Examinations in Samoa have shown a need for improvements in teaching and learning of science in the primary classes. If the science examination results are to improve, information is first needed about what is happening in the classrooms when teachers are teaching science. This research describes the current situation and focuses on the challenges that are encountered by teachers in their preparation and planning of their daily classroom teaching. The research project also evaluates how the Primary Educational Materials Project (PEMP) have been utilised as these materials emphasise the use of student-centred approaches to learning and can potentially help in the preparation of both pre-service and in-service teachers,

The purpose of this research study was to assess the use of PEMP books and resources that are used by teachers teaching science in Year 8 classes. Three science teachers' classes were observed, administered with questionnaires and then interviewed on how they plan using the PEMP books to teach science. Discussions and interviews with the teachers provide insights about their assumptions and beliefs in teaching science. Responses revealed that subject matter knowledge is crucial for good teaching and student understanding. Participants expressed the need for more professional training in order to develop skills like questioning, critical thinking and creating curiosity and interest in students. This study suggested that both pre-service and in-service trainees should be trained in a way which emphasizes the importance of developing these skills.

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Special acknowledgement and thanks goes to the three teachers who willingly took part in this study. For reasons of anonymity and confidentiality I will not reveal the names of the participants. This study would not have been possible without your kind cooperation and assistance.

DEDICATION

This thesis is dedicated to my three children, Joyce, Jason and Jenson and in memory of my husband Varghese.

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1. CONTEXT OF THE STUDY

1.1 Introduction

This chapter intends to provide some background information on Samoa and the education of its people to assist the reader to appreciate the context of this research. This research was an opportunity for me to interact extensively with local teachers and find out their views on teaching and learning science in primary schools in Samoa. As a science educator I see a dynamic relationship between my research and teacher education, so the implications of these findings will have a direct influence on how I teach and design courses for my pre-service classes.

1.2 Samoa-the Setting

Exponents of the Austronesian culture left South East Asia about 7,000 years ago travelled southwards through the coastal areas of Papua New Guinea towards the South Pacific where they reached the Fiji- Samoa-Tonga triangle about 3,000 years ago. In Samoa, the South East Asians' culture adapted and developed in accordance with local conditions. The impact of continuous inter–island migration after the Austronesians had settled the Pacific Islands also influenced local developments shaping them into the Samoan culture that existed at the time when the Europeans made first contact with the local people in the late 1700s. The 1800s were a politically difficult time for the Samoans as three foreign powers Great Britain, Germany and the United States of America competed for territorial possessions in Samoa. The result was a division of the island group by Germany and the United States of America. The German authorities administered Western Samoa from 1900 to 1914 before surrendering control of the group to New Zealand at the time of the First World War. The establishment of the

United Nations (UN) in 1945 and the implementation of anti-colonial policies resulted in Western Samoa gaining independence in 1962 (Cyclopaedia of Samoa *et al*.,1983).

Samoa is a group of volcanic islands which extends for 225 miles on an east-west line in the central Pacific in an area bounded by latitudes 13 degrees and 15 degrees south, and longitudes 168 degrees and 173 degrees west. The western group of islands comprises of ten islands of which Upolu and Savaii are the main two islands. There are eight other smaller islands they are Apolima, Fanuatapu, Manono, Namua, Nuutele, Nuulua, Nuulopa and Nuusafee. The total land area of Samoa is approximately 2,934 square kilometres. Samoa's population is approximately 180, 000 with a homogenous language and culture.

The map of Samoa in figure 1 is intended to give the reader its size and location of the main inhabited islands

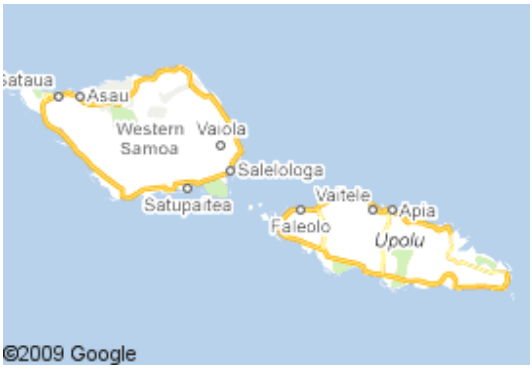

Figure I - MAP of SAMOA

1.3 Background of Early School System

The establishment of village mission schools in the early 19th century was brought about by the arrival of the European missionaries. This was the beginning of formal schooling in Samoa. In such a system, curriculum was based on Christian beliefs and there was no involvement of the community in curriculum development. Concern about the relevance

of the school curriculum to life in the islands, in both orientation and content, was closely associated with the movement of many of the islands. After the First World War when New Zealand was awarded trusteeship over Samoa, they introduced the concept that education is a state responsibility and duty, and started to take over the village schools (Ministry of Education Sports and Culture (MESC), 2002 Policy Planning and Research Division). In 1953 New Zealand examinations of School Certificate and later University Entrance were introduced. For over a hundred years from the early nineteenth century until mid 1960s, the curricula of the Pacific Island schools closely resembled those from where their colonial 'masters' came. Research reports and studies have shown that the education systems in the Pacific Island countries have not achieved much in providing quality education for their citizens (Thaman, 2002). All these forms of education in the Pacific region today derive their meaning from western culture and tradition and are usually different in their conceptions of what education traditionally means in the culture and communities of the Pacific (Taufe'ulungaki, 2002 p5).

1.4 Samoa's Educational System (Development of Curriculum Unit)

A curriculum development unit was established in Apia in 1970 to develop teaching materials for the primary and junior secondary schools (MESC, 2002 Policy Planning and Research Division). Teaching materials were developed in the 1970s, since then some revision has been undertaken, but did not include major changes in terms of reforming the primary curriculum framework. However, notable changes were made with the Primary Education Materials Project (PEMP) (1996-1999).

In planning for further development of education, attention was focussed on quality and delivery improvement, infrastructure upgrading, curriculum development, production of text books, teaching materials, and professional development for teachers. A committee was set up consisting of the Western Samoa Department of Education (now the Ministry

of Education, Sports and Culture), educators throughout Samoa from both private and public sectors, parents and the wider community. There was assistance provided by the Ministry of Foreign Affairs and Trade in funding the project. The publication of the first document of Western Samoa Education Strategies, (1995-2005) clearly established the intention to make changes within the education system of Samoa.

The Ministry of Education Sports and Culture (MESC) is responsible for the development of the school curriculum, the national examinations, in-service teacher trainings, recruitment of teachers and other education related matters. The MESC appoints the principals for all Government schools and colleges as well as the School Review Officers (SRO) to oversee the twenty one school districts. The SRO in each of the twenty one educational districts supports government teachers and school communities in the implementation of all educational services.

The Curriculum Materials and Assessment Division (CMAD) designs, develops and revises curriculum and support materials for all the schools. Each subject area has a Curriculum Officer within the CMAD and a subject committee comprising of selected teachers from government, mission and private schools. A total of 159 primary schools are located throughout the country with 141 government schools, 13 mission schools and 6 private schools. In addition, 8 schools cover both the primary and secondary levels and are categorised as primary secondary schools (MESC 2006 Strategic Policies and Plan).

Primary education covers an eight-year cycle from Years 1-8. The 2005 school census data (MESC report) showed a total of 4,074 children attending primary school. Under the Education Amendment Act (MESC, 2005 Policy Planning and Research Division),

education is compulsory for children aged 5-14. Normally, Year 8 students in primary schools throughout Samoa sit the Year 8 National Examination to qualify for secondary level. Secondary education covers five years from Year 9 to Year 13. Like primary schools, MESC is responsible for the recruitment of teachers and their salaries, the supply of stationery, curriculum materials, assessment and examinations and teacher in-service training. At Year 12, students sit the Samoan School Certificate Examination. At Year 13, students are expected to sit the regional examination Pacific Senior Secondary Certificate (PSSC) which is administered by the South Pacific Board of Educational Assessment in Fiji. Students who pass PSSC are qualified to enter Foundation Year at the National University of Samoa or overseas.

The secondary schools play an important role in preparing students with the essential skills they need to contribute to their community and prosper whatever activity they become involved in. The tertiary education in Samoa involves two main tertiary institutions which are the National University of Samoa (NUS) and the University of the South Pacific (USP). The National University of Samoa currently offers credit programs at diploma and degree levels. NUS is aware of its unique obligations derived from being the National University in Samoa. NUS recognizes that its responsibilities to the communities and the MESC, include the provision of education and training, including academic, technical and vocational training and continuing education at appropriate levels to the needs of the people of Samoa (MESC, 2006 Corporate Plan).

1.5 Primary Education

The educational goals for Samoan students as set out in the educational policies, (MESC 2003 Cooperate Plan) are for students to be innovative, creative and to be skilful

in the use of inquiry methods. The underlying assumption is that all students can be successful learners regardless of their abilities when they are provided with sufficient time and support. If these goals are to be realised we need a curriculum which aims to develop these skills in our students. Samoan Curriculum recognises that for students to succeed, curriculum experiences must relate to students interests, needs and learning styles. The curriculum in the early primary (years 1-3) consists of 26 themes and five core subjects in years 4-8 namely, English, Samoan, Mathematics, Social Studies and Science.

The 1960 referendum carried out by the United Nations overwhelmingly adopted the official languages of the Samoan government to be both English and Samoan. This means that a legal framework for bilingual education has existed for more than forty years. This was recognised in 1995 when the Department of Education's ten-year policy (1995-2005 Western Samoa Education Strategies) document that defined the aims of education in Samoa, also highlighted a desired outcome of the system as "the production of bilingual individuals, fully literate in both Samoan and English". Currently, MESC is concerned about the English language skills of students. Department of Education (1995-2005 Western Samoa Education Strategies) policies document has this statement: "*Although most classroom teaching is in Samoan, the Year 8 examination is in English except for Samoan language. The absence of a systematic bilingual methodology and teachers who lack bilingual ability, mean that most students are linguistically disadvantaged*". The present practice within schools of introducing English as a subject from Year 4, and then as language of instruction from Year 7, is in fact not in accordance with national policy goals of producing bilingual individuals. Perhaps one issue that is still a contentious one today is "code switching" by teachers which is regularly switching from English to Samoan when teaching in Years 7 to 13 (Lee-

Hang,2003). Samoan is a language that teachers and students are comfortable with and can understand better. This practice is an effective way for bilingual speakers of Samoan and English to communicate. Teachers are often the only source of English input for many students in the classrooms. There is a concern that the academic English language required for learning and performing successfully in examinations will not have been achieved by many students because of code switching.

1.6 Student Centred Teaching and Learning

For those of us involved in teaching and curriculum development, we would say that it is not a new idea to have students at the centre of their own learning. The Samoan curriculum is very content prescriptive and very much exam-oriented. Due to the number of National Examinations (occurring in Years 8, 12 and 13) in which students are involved throughout their primary and secondary years, the curriculum is very much exam-oriented. There are schemes in the primary schools which are also very prescriptive in nature where every lesson step is prescribed for the teachers to follow. Teachers rarely deviate from these prescribed lesson steps.

The most recent change introduced to the primary schools has been the introduction of the Primary Education Material Project (PEMP). The focus of the PEMP project was on the development of students' workbooks and the production of live and educational broadcasts. PEMP is a new set of materials that was implemented to supplement the content of the old curriculum and to develop the scope and sequence of lesson delivery. A recent report (MESC, 2005 Policy Planning and Research Division) on the implementation of this project found that most teachers have difficulties in using PEMP materials in the classrooms. Most teachers believe this to be a set of materials to support what is already there rather than considering how they could use the materials

to reshape the way they teach. The newly introduced PEMP materials emphasise the use of pupil centred approaches to learning.

1.7 Culture in the Curriculum

In the Samoan culture, children are mostly expected to listen and obey and not to ask questions or question the adult's authority (Pereira, 2005). One is expected to just go along with what has been directed, no matter whether it fits in with what one believes in or not. The background experiences of teachers in terms of their own learning in school contexts will also influence their beliefs about teaching and learning. For example, a teacher who comes from a background where she is directed to do things rather use initiative and creativity is more likely to behave similarly with her students in the classroom. Studies show that classroom curriculum should be related to the day-to-day lives of students.

1.8 Postmodernism Theory

In order to improve the quality of education, reviews have been taken in recent years covering all courses in the curricula. After reviewing the curriculum and taking into account the needs of the Samoan students, the policy makers decided that Samoa needs a curriculum that responds to change. A curriculum that would make a connection between the needs of Samoan students and society and what happens in the classroom. In a global world, teaching and learning have become more challenging to both students and teachers in Samoa. As Sarup (1993) points out educational policy today put emphasis on skills and training, rather than on a vague humanist ideal of education in general. We live in a postmodern world where the old boundaries, voices and power structures are constantly being questioned. According to (McKinley, 2000) educators have begun to think that science itself is a culture whose knowledge and values may have effect in today's schools. From this perspective, the changing ways of viewing the

world and cultural practices fit with “postmodernism” theory. Denzin and Lincoln (1994) explain that postmodernism represents an intellectual position that claims we are living. in a “post” modern era. To bring changes, in service trainings have been initiated by the MESC and the National University of Samoa by offering short term courses. However there is hardly any change from the well entrenched teacher directed approach (Afamasaga, 2002). Students need opportunities to do activities than memorise what the teachers and books tell them. Teachers can help students acquire deep learning by encouraging students to actively participate in doing, discussing and creating. In Samoa, competition for white collar and professional jobs gain much attraction for students as well as their parents. The “post-colonial mentality” according to Moli (1993) is a major factor in parents’ perception of western education and western qualification.

1.9 Literature Review

The tradition of classical education was attacked for its lack of relevance to wider sociocultural settings (Tanner & Tanner, 1980). The relationship between cultural values, beliefs and educational practice is recognised as being very important by Pacific educators (Thaman 1993; Tupuola 2000; Nabobo, 2002). However, Pacific educators (Afamasaga 2002; Thaman 1993) describe formal education as a colonial remnant that is inconsistent with Pacific culture. Many developing countries including Samoa strongly support the idea of a formal education (Tavola, 1991). In Samoa, competition for white collar and professional jobs gain much attraction for students as well as parents (Moli,1993). Samoan parents commonly have the view that passing examinations is the ultimate measure of a child’s intelligence even if the children are talented in other ways.

Teachers are trained in very teacher-directed styles, though they are encouraged to use the child-centred approaches when they go out to teach. Unless teachers experience how to teach and learn interactively, it is unlikely that they will be able to use it themselves. It is very important for teacher educators to look at the way they teach courses so they model the teaching practice that they are encouraging.

The target areas for educational research in Samoa have been low achievement in Science and Mathematics in Year 8 National Examinations. Perhaps one of the biggest criticisms of high stake testing has been in negative influence on the teaching and learning processes. The method of assessing students' learning process in Samoa is pen and paper tests (Pereira, 2005). There is a need for multiple and varied system of assessment which ensures quality learning and teaching (Clarke, 1994., Wragg, 2001) The type of teaching that is going on in classes allowed very little critical thinking (Lameta, 2000). Tobin (1987) lamented that variations in science teachers knowledge about science and teaching may influence the way teachers implement lessons. Some of the theoretical assumptions of qualitative research were described by Bodgan & Biket (1992) that meaning and process are crucial to understanding human behaviour, that the descriptive data is what is important to collect and analysis is done inductively. A theme emerging from the literature is that for students to be successful in science they need to understand and engage in the knowledge that is examined (Romberger, 2000). From the data collected I was able to address the issues of planning of lessons and the style of teaching in Year 8 classes.

1.10 Assessment and School Qualification

In order to meet the demands of a developing society in Samoa it is essential to keep the key elements of equity, quality, relevance and efficiency in the Samoan Educational system. The Government of Samoa is fully committed to the achievement of quality

goals which include the improvement of literacy and numeracy, teacher quality, curriculum materials and assessment policy, management of education, infrastructure, financing community participation and support and monitoring and evaluation. The ultimate goal of education in Samoa is for all learners to access good quality education. There are concerns that the education system was not meeting the needs of either rural or urban community demands (Afamasaga, 2006).

The quality of the Samoan education system is determined by the four types of assessment. These are the Samoa Primary Educational Literacy Level (SPELL) tests at Years 4 and 6 and the National Examinations at the end of Year 8 (Year 8 National Examination) and Year 12 (Samoa School Certificate) and a regional examination at Year 13 (Pacific Senior Secondary Certificate Examination).

Samoa Primary Education Literacy Levels (SPELL) tests are conducted at Years 4 and 6. These tests are for determining the standard of literacy at the early stages of primary education. The areas covered in these tests are Samoan, English and numeracy. In the last five years, examination results in the SPELL tests and Year 8 and Year 12 examinations have declined. The quality of teaching and inadequate teaching resources are some of the factors that are related to this decline (Afamasaga, 2006). The major form of evaluation is where students are examined at the end of each term and at the end of the year through examination and formal testing. Entrance to secondary education is determined by the Year 8 National Examination. The quality of assessment in terms of validity and reliability may be other important factors. As long as exam-driven education exists in Samoa, the authoritarian or teacher directed approach will remain featured in Samoan classrooms.

This research investigates personal concerns I have with regards to teaching and learning science in primary classrooms. As a teacher and also a science educator, I am interested in the issue of poor achievement in Year 8 National Examinations in primary schools in Samoa. I decided to carry out my study to find out about how Year 8 science teachers' ideas about learning influence their choice of methods of teaching and their use of resources in their classrooms.

2. STATEMENT OF THE PROBLEM

This chapter looks at the problem and some background information relevant to the study. The National Examination has been part of the educational system in Samoa since formal education commenced. However, the extent to which this examination dominates teaching and learning practices of today is of real concern for both teachers and students at the Year 8 level in Samoa. This study is an attempt to explore the ways teachers plan and use resources in teaching science at primary level.

2.1 Background to the Study

Teacher education in Samoa was incorporated into the National University of Samoa in 1997 as a strategy to improve the quality of teachers and the quality of teaching in schools. The Faculty of Education (FOE) plays a key role in curriculum design and implementation through pre-service courses and professional development programs provided for teachers. The aspirations of the MESC are that teacher graduates are well prepared to meet the needs of students and have a thorough understanding of the Samoan curriculum and pedagogy so there is a close and supportive relationship between the MESC and FOE. Ten years later, the standard of student achievement in schools is at an all time low especially in Science and Mathematics (Afamasaga, 2006, MESC, 2005 Policy, Planning and Research Division). Since the establishment of the NUS in 1997, more national research on education has been undertaken by Samoans living overseas and locally. The target areas for education research have been low achievement in mathematics, curriculum development, teaching methodologies and language of instruction and assessment.

The type of teaching involved is teaching to the test, which allows little extension for the able learner (Lameta, 2000., Afamasaga, 2002). Science teachers consider that it is important to cover all topics being examined. This often leads to teachers concentrating on students who appear most able to pass their examinations (Esera, E & Sooaemalelagi, 2004).

An emphasis on the development of more active and creative learning environments in classrooms and greater reflectivity in teachers and pupils is needed (Zaitun, 1999). Furthermore, little comprehensive research on science teaching and learning has been conducted in schools in Samoa. If science teaching is to move from rigid, didactic methods commonly associated with a past era, and if science examination results are to improve, information is first needed about what is currently happening in classrooms (Thorp, Burden, & Fraser, 1994). The research study described in this paper is part of the study focusing on primary science teaching in government schools in Samoa.

2.2 Problem Setting

In recent times (2000-2006) achievement levels for Samoan Year 8 National Examinations have shown a slow downward trend (Table 1) (MESC, 2002 Samoa Department of Education Statistical Digest). The existing situation of having Year 8 students in Samoa completing the National Examination, often ends in drastic results impacting on their future educational opportunities. Of note here is the fact that less than 3% of all students who had enrolled (Table 2) in Year 8 actually qualified to enter the NUS (MESC, 2002 Department of Education Statistical Digest). Research conducted by Afamasaga-Fuatai, K. (2002) concluded that students' critical skills to analyze and effectively apply what they knew to problem-solving were lacking. Most raw scores were below 50% with Science and Mathematics the lowest scores of all 5 subjects (Table 1). The teaching and learning approaches and the training of both in-service and pre-

service teachers have become major challenges for the NUS and the MESC. The problem of low achievement in the Year 8 National Examination in Samoa as shown in Table 1 below is of grave concern and research is needed in order to find ways to minimize the problem. My research aims to study the perceptions of the teachers concerning teaching of science using PEMP books in Year 8.

Table 1: Average raw score at Year 8 National Examinations in Samoa from 2000 to 2006

Subject	2000	2001	2002	2003	2004	2005	2006
English	41	45	38	37	40	49	43
Samoan	56	47	45	48	46	43	52
Mathematics	34	30	31	29	26	32	33
Basic science	37	29	29	25	29	37	33
Social science	44	46	31	28	34	36	41

(Source: MESC Samoa Department of Education Statistical Digest, 2002)

Table 2: Number of students sitting Year 8 National Examinations in 2000-2006

Subject	2000	2001	2002	2003	2004	2005	2006
English	3983	3971	3850	3816	3961	4122	4171
Samoan	3934	3930	3854	3789	3929	4110	4123
Mathematics	3984	3977	3831	3816	3964	4122	4171
Basic science	3982	3972	3854	3816	3965	4121	4171
Social science	3984	3971	3849	3816	3966	4121	4171

(Source: MESC Samoa Department of Education Statistical Digest, 2002)

Samoan education has in the past, and still does today, placed an emphasis on success in examinations. Pressure to succeed is applied from an early age. Success throughout primary school is important as the National Examination held at Year 8 determine the top

stream of students who go on to the top government secondary schools (Petana-Ioka, 1995). Year 8 National Examination results can be relied on as a successful selection process. Of concern were the relatively poor scores being achieved repeatedly by the students in all the five subjects (Table 1). The language of instruction from Year 7 onwards is meant to be in English, although most classroom teaching is still unofficially in Samoan (Lameta, 2000). The Year 8 National Examination is presently conducted in English in all the four subject areas except Samoan. If bilingualism is an effective tool for teaching and in terms of increasing students' understanding, then why do examiners, curriculum developers and educational policy-makers not follow suit, by adopting it (Lee-Hang, 2003)?

The topic of second language learning and achievement of school students has been well researched internationally (Cummins & McNeely, 1987, Escamilla, Chavez & Vigil 2005). Researchers have conducted a number of studies in the area of students' language difficulties in education such as Osborne and Freyberg (1985) who documented their work in the learning in science project (LISP) which explored the language of issue in the science classroom. Language is absolutely essential to learning but the current situation in Samoa is that teachers teach in Samoan and assess the students in English. Research conducted by McKinley, McPherson and Bell (1992) stressed the importance of using more culturally appropriate teaching, learning and assessment activities in science, in order to improve achievement and cultural connectedness of Maori students in New Zealand. Teaching science, in meaningful contexts for students, has been an emphasis in the 1990s in New Zealand national curricular developments. New Zealand teachers frequently used practical work, especially structured student activities and open investigations, for developing practical skills as wells as for conceptual understanding (Millar & Driver, 1987).

The notion that children learn by listening and observing is consistent with teacher-centred pedagogies in primary classrooms in Samoa (Pereira, 2005). This study indicated that in Samoa, teachers impart knowledge to students who acquire it by carefully listening and observing the teacher. Teachers write examples on the blackboard and students copy down notes in their exercise book. Students do not participate in the act of knowledge construction. Lack of resources also contributed inappropriate use of time by the teachers. Lack of textbooks, readers and simple equipment also made it difficult for teachers to plan for class activities.

The ways in which we view learning can determine the ways in which we approach teaching in the classroom (Brandsford, Brown & Cocking, 1999). In terms of teachers' practices in teaching science, Loucks-Horsley, Hewson, Love, and Stiles (1998) explained that teachers need to focus more on methods such as, inquiry-based learning, investigations, problem solving, and application of knowledge. According to Bell and Kirkwood (1993) teaching is interacting with students' thinking, helping students clarify and reflect on their own ideas, challenging students, helping students change their ideas, helping students find answers for themselves and getting them to think and respond. Teachers need to feel competent and comfortable in their capacity to create new appropriate learning environments for their students. It seems that an investigation of the relationship between teachers' ideas about learning and what they do in classrooms to help students learn is a valuable pursuit.

Most Samoan classrooms are teacher centred. Teacher centred teaching, however, tends to promote rote–memorisation of facts and generally halts creative learning in the classroom (Pereira, 2005). According to Pereira (2005) teachers seem to favour continuous repetition and whole class chanting. To bring about changes, in-service

training has been initiated by the curriculum unit and short term courses have been offered by the National University of Samoa. Many teachers have found it difficult to attend these in-service workshops because these workshops were conducted during school hours and teachers thought their priority was teaching their students. However, the teacher training report (Afamasaga, 2002) found that in the classrooms, there was hardly any change from the well entrenched teacher directed approach because many teachers had not participated in the in-service training or had not implemented practices despite their involvement in the in-service training.

Most developed countries like Japan and Germany for example, continue to enjoy their developed status because of the existence of a highly qualified and scientifically literate pool of human resources that they rely on for innovation and solution findings. In Samoa, like any other developing country, the education system is entrusted with the enormous but vital responsibility of producing a scientifically literate and qualified human resource.

Teachers prefer teacher led classrooms in Samoa. This feature refers to the various ways in which teachers react to students' responses and not vice versa. Teachers are perceived as legitimate sources of authority and knowledge, while children have limited right to express their likes and dislikes (Mageo, 1998). The change to student-centred learning is needed to overcome poor academic achievement in all subject areas (Pereira, 2005) and to make the learning more relevant to students. As Bransford, Brown and Cocking (1999, p. xiii) have noted: "Learning must be guided by generalized principles in order to be widely applicable. Knowledge learned at the level of rote memory rarely transfers; transfer most likely occurs when the learner knows and understands underlying principles that can be applied to problems in new contexts".

Many innovative programmes for teaching science with hands on approaches have stemmed from the science curriculum (PEMP) materials. Rather than viewing science as a body of facts to be learned, these materials view science in a structured and directed way of using questions about the world around us. If the teacher is confident in his or her background knowledge of the topic, then traditional knowledge and beliefs can be included in class discussions and initiate meaningful learning (Lee-Hang, 2003).

In Samoa teachers very seldom diverge from curriculum materials. This was noted by Esera (1996) and Lake (2001) where teachers showed unwillingness to try new ideas and move away from the curriculum. Learning is a highly contextualised and situated activity. In understanding learning in science, we need to consider not just the meaning made by an individual, but the context in which it is taking place (Bell & Cowie, 2001). Teachers should encourage learners to be self-reliant and develop independent modes of learning. The main factors affecting the implementation of any educational innovation include the changes in the traditional practices like “chalk and talk” and “lots of copying on the blackboard” (Pereira, 2005, p. 142). How teachers approach their work, how students go about their learning, and how both groups interact with each other are shaped by the quality of teachers training. Many different activities and pedagogies to improve the learning of science have been developed in Samoa; however most teachers seldom deviate from the traditional way they were taught in their classrooms twenty years ago.

2.3 Summary

In this chapter, I have introduced the problem for this study. I began by giving some background information relevant to the study and then addressed the problem that this

study is concerned with which is low achievement in science in Year 8 National Examination. I decided to focus on how teachers can divert from their traditional practices through the use of PEMP materials to promote more active and creative learning environments in classrooms. The next chapter presents the research methodology.

3. METHODOLOGY

This chapter outlines the methodological instruments used in finding and compiling the data required for the study. In order to understand the methods of science teaching in primary schools the participants' experiences and beliefs and classroom culture have been the main focus of the study. It also outlines the ethical considerations taken and sampling procedures.

3.1 Formal Schooling: Primary and Secondary Education

The greatest challenge for education in any country is being able to continuously and consistently clarify what is meant by quality in education, setting goals and working towards achieving these goals. Education is seen as important as Samoa is entering the globalised and more competitive economy of 21st century. Quality issues in any education system are rather complex. In the educational policies of Samoa (1995-2005 Western Samoa Education Strategies) the strategy for development of primary education called for: the provision of adequate physical facilities, establishment of learning standards and learning outcomes; the development of assessment methods to measure achievement and provision of pre and in-service teacher education; production of proper and adequate resources; on–going curriculum development and effective and realistic educational policies.

Education in Samoa faces major challenges in an era of unprecedented globalisation. Coxon (1996) (cited in J. Pereira pg.43) in her study of policy development in education in Samoa emphasizes tension between global and local interest because we need both. The educational goals for Samoan students as set in the 2006-2015 education policies are for students to be innovative, creative and in skilful their enquiry methods (MESC,

2006 Strategic policies and Plan). If these goals are to be realised, we need a curriculum which aims to develop these skills in students. There is a current debate going on in Samoa with educators and the community stake holders regarding the poor literacy levels of students. The primary goal of education is for students to pass examinations like the Year 8 and Year 12 National Examinations and PSSC. Schools are often judged by the performance of their students in these examinations. We are seeing this phenomenon of comparing the students' achievement by school, worldwide. Concern about poor performance on these Samoan examinations, especially in science has been expressed in reports by educators (Afamasaga, 2002). A study conducted by the Ministry of Education Sports and Culture in collaboration with UNDP as reported in Lameta (2000) confirms there is a decline in literacy and numeracy standards in Samoa. The research study for this thesis marked the beginning of investigations into the teaching and learning of primary science as it is a real concern.

3.2 Research Design

The research was designed to observe the participants' teaching before the interviews were carried out. Participants' observation were carried out based on Erickson's (1986) model to find out how teachers engage students during classroom tasks. Questionnaires were designed refined and distributed to all the three participants to solicit their views on using PEMP books in the preparation and teaching of science. Semi-structured interviews were carried for teachers using the questionnaire (see Appendix 3). The questionnaires included "open-ended" questions. Interviews were carried out individually in relaxed settings.

3.3 Research Questions

As indicated earlier, this study stemmed from my personal interest in teaching and learning in Year 8 classes. Being a science teacher I decided to focus on Year 8 teachers' approach to planning science content. The research questions were:

- What do teachers of Year 8 science think learning is (involves)?
- What resources do teachers use in the planning and teaching of science?
- What is the language of instruction in the class?
- Are interactive activities included in the lesson plans? Are students given chances to ask questions or express their ideas? If yes, how is it done?
- Are activities carried out by the students in the classrooms?
- How does the teacher encourage development of skills during lessons?
- What types of assessments are carried out in the class other than examinations and testing?
- What influence do these assessments have on teachers' planning and implementation of lessons?
- What are the perceptions of science courses that you have taken at NUS during your training period?

3.4 Participants and Setting

The selection criteria was that participants had to be graduates from the National University of Samoa after its establishment in 1997. Teacher education was merged into the National University of Samoa in 1997 as a strategy to improve the quality of programmes offered and hence the quality of teaching in schools. The quality of teaching plays a major role in the quality of learning (Afamasaga, 2006). 'Purpose sampling' was used to achieve a sample of a few teachers who have completed the

Diploma in Education at NUS. Teachers for this study were selected from two government primary schools. Five teachers were asked initially, but three agreed to participate. These teachers had taken science courses with me during their teacher training periods, but as part of this project, I had to build a relationship of trust that was "negotiated with full disclosure of the risks which respondents are taking" (Lincoln & Guba, 2003,p.230). I visited these teachers a number of times to discuss the research. A trust was strengthened throughout the data collection process. This research study uses questionnaires, interviews and classroom observations as methods of data collection. As Flick (1998) stated, a qualitative researcher uses various techniques and procedures to capture the complexity of the social setting under study. As a researcher I decided the questions and took four months for data collection.

Table 3: The teachers who were involved in the research

Name of teachers	Qualification	No. of years of teaching
Mr. Afa	Dip in Education	10 Yrs
Mr. Mike	Dip in Education	3Yrs
Mr. Pone	Dip in Education	6Yrs

3.5 Gaining Access

According to Anae, Anderson, Beneseman, and Coxon (2002), one way to select participants is to undertake consultation with authorities. I had consulted a research officer at the Ministry of Education Sports and Culture and identified two government primary schools, principals and teachers for my study. I have given these schools pseudonyms: Lagi primary school and Vasa primary school. Both of these schools are situated in the urban area of Samoa. The teachers who agreed to take part in the study

are Mr. Afa (teacher 1), Mr. Mike (teacher 2) and Mr. Pone (teacher 3). As mentioned in Table 3, the participants of the study were Year 8 science teachers. In order to avoid identification, the participants chose pseudonyms. Purposive sampling was done as they were already selected by the principals of the schools. As a researcher I was interested in pursuing the topic of how teachers use resource materials in teaching Year 8 science and their perceptions of using PEMP books.

Kvale (1996) reminds us that ethical issues must be considered at all stages of the research study. Issues like participant informed consent, confidentiality and anonymity were considered. The nature of the society, where teachers often meet for cell meetings and work closely together, meant that it was likely they would talk to each other about taking part in my research. While the guarantee of total confidentiality and anonymity to the participants is generally not considered a pre-requisite of research (Plummer, 2001, as cited in Glesne, 1999), this was taken into consideration when I contacted the participants and planned the location for the interviews and times for class observations so they would be less nervous.

I visited the participants and initially contacted them by phone calls. Smith (1999) reminds us that consent for indigenous people does not necessarily mean consent for "a project or specific set of questions, but for a person, for their credibility". Consent also gives the view that the trust that is generated will be reciprocated. Once academic approval from the MESC (Appendix 1) and the Research Ethics Committee's approval from the National University of Samoa (Appendix 1) were obtained, I submitted this to the University of Canterbury Ethical Clearance Committee (Appendix 1). These ethical clearances were deemed necessary for two reasons; one to abide by modern research ethical practices when dealing with human ethics and the second to follow local Samoan protocol and Public Service Commission policies with respect to ethical clearances and

work place rules within Samoa's primary, secondary and tertiary institutions. I approached my participants individually. Once the participants showed their willingness, I handed them a formal letter outlining information about the project (Appendix 1)

3.6 Data Collection

In regards to this study, stage one dealt with the observations of classroom teaching. The data I collected from observation of teachers teaching and interviews provided information for this research study. Talking to the participants often enabled me to ask questions at times when I wondered about certain explanations given in Samoan while teaching. Glesne (1999) recommends taking time to establish a rapport with participants before going into interview questions. I was a nervous researcher in this context because of a lack of Samoan 'cultural sweat' -a term coined by C. Mutch (personal communication,12 October, 2005) to describe the nervousness associated with ensuring that I get it right without making any blunders when questions are asked to the participants. The risk that I considered was the possibility of inappropriate ways of interpreting behaviour or making conclusions when I observed classrooms. But I found that participants and I were relaxed during the interviews.

3.7 Analysis of Questionnaire

Questionnaires used for teachers' interviews were distributed 4 weeks before the interviews. I was able to share with participant teachers about the questionnaires. My approach to the research had been collaborative with participant involvement throughout. Consultation was vital with each of the participant. The analysis of the questionnaire was based on the pattern matching strategy, where methods of teaching, use of PEMP books and planning of lessons. According to Barton & Lazarsefeld (1969

pg 166) research can be sometimes like the nets of deep-sea explores, qualitative studies may pull up unexpected and striking things for to gaze on.

3.8 Limitations

As a researcher I was faced with a few challenges. Informal preparation for this research started before the formalities begun. With my limited knowledge of Samoan, participants were forced to teach in English while I was observing them. Even though the participants accepted my request, they agreed to teach in English and in Samoan for the sake of their students. Recent literature (Pereira, 2002) raised issues about how language competency impacted on students' performance in the Year 8 National Examinations. In Samoa, the language of communication, both at home and outside of the classroom, is Samoan but English language skills are important during class. "Research requires time, patience, skills and a clear acknowledgement that ethical and cultural matters are important" (Spoonley, 1999, p.58). The academic English language required for learning and performing successfully in examinations is not achieved by many students when taught in Samoan. In primary schools in Samoa, teachers are expected to teach all the core subjects such as Maths, English, Social Studies, Science and Samoan. Mr. Pone and Mr. Mike indicated that they had limited background knowledge of science. Hence, teachers were not necessarily selected to become specialist science teachers. Exemplary teachers have been shown to be effective because of their strong content knowledge, concern for meaningful learning and consistent monitoring of student understanding of science concepts (Tobin, 1988).

3.9 Classroom Observation

My intention was to collect some data to examine what we need to include in our courses that are offered at the National University of Samoa to improve pedagogical

content knowledge of teacher trainees. I observed three teachers while they taught science in Year 8 classes. The skill I was looking at was how they explained concepts i.e. whether the teacher used different explanations for different circumstances. The questions that teachers use can raise additional questions that can encourage pupils' involvement and stimulate pupil thinking. I was also interested to find out what activities and resources they used for teaching science. I observed each teacher once, teaching for a period of 50 minutes.

3.9.1 Teaching and Learning in Classroom-One

The observation of science classes was conducted as part of data collection for my thesis. It was anticipated that teachers would use questioning techniques to probe students' understanding during their classes. I observed Mr. Pone who is an experienced teacher with 6 years of teaching in Year 8 class. As I entered the Year 8 classroom, Mr Pone was seated on his chair in front of the classroom. He welcomed me into his class. This class consists of 32 students, 13 girls and 19 boys. The classroom had some wall calendars and students' scores in each subject on a chart. I had talked to Mr. Pone about the aims of my observation: How does demonstration become teaching? How does a student learn something? How are students involved in learning?

Before Pone started his class he asked the students to move to the front and asked to sit on the floor. He introduced me to the students and I felt comfortable as an observer. The teacher started the lesson on the topic "light". I audio taped the whole lesson, at the same time I wrote down the students' behaviour during the lesson. The lesson lasted for 50 minutes. After the lesson it was recess time. We sat down and talked, Mr. Pone agreed to come and listen to the tape when he is free. As promised he came to my work place after two weeks and listened to the tape again.

3.9.2 Teaching and Learning in Classroom Two

Parents may want to know why their sons and daughters are not performing well in their National Examinations. Keeping this in mind Mr. Afa started to revise what he had covered in the first two terms of the year. Although he has a very tight schedule, he still agreed to my request. There were 15 girls and 6 boys in this Year 8 class. The students were all seated on their chairs. He welcomed me into his classroom. Mr. Afa was planning to go through a Year 8 National Examination paper that day. The National Examination was 8 weeks away when I went to observe him. Afa came to see me the next day and we listened to the tape together.

3.9.3 Teaching and Learning in Classroom-Three

In Mr. Mike's classroom the students immediately moved to their seats from the floor as he entered the classroom. This class consisted of 16 boys and 22 girls. His lesson was a continuation of the previous lesson on "heat." He had few questions in English and the whole class gave out answers in English. I tape recorded the whole session. For the majority of the time the teacher was talking both in Samoan and in English. The teacher then wrote an activity on the board from the PEMP material and students copied from the blackboard. The lesson lasted for 50 minutes. Mr. Mike came to me the next day and we listened to the tape of his lesson.

3.9.4 Analysis of the Classroom Observations

When I initially listened to the tapes of the classroom teaching of the three teachers, I realised my intention to find out the questioning techniques was difficult. I listened to the classroom teaching and thought that teaching and learning would be interactive, but it was not. I observed a total of 90 Year 8 students between the ages of 12 and 14 for 3 hours in their classrooms. I have noted the teachers were teaching from the PEMP

books. These books are a new set of materials that have been used to supplement the contents of the old curriculum, to extend the scope of the curriculum and provide guidance for sequencing lessons. Teachers spoke a lot, students listened carefully, copied down from the blackboard and kept to themselves. The PEMP materials emphasise the use of student-centred approaches to learning, but I did not observe students interacting in the classrooms. For example a lesson on soil erosion, is explained in the PEMP book as follows:

"Collect two plastic trays dig out some grass covered block of soil to fit into one of the trays. In the second tray collect soil from the same area with no grass to fit into the tray. Rest the trays at an angle 40 degree angle. Pour a large container of water evenly across the top of the tray from a height of 1 metre. Repeat the same for the other tray. Observe and record what you see with trays".

During my observations, students just copied this activity from the blackboard.

Another lesson I had observed was on reflection of light. The method to draw a line of reflection is explained in the PEMP book step by step as it follows:

1. Find a smooth surface alongside a wall.

2. Roll a round ball along the smooth surface towards the wall.

3. Mark the points where the ball starts, where it hits the wall and where it finishes.

4. Draw line at 90 degrees to the point where the ball hits the wall.

5. Draw a line from where the ball hits the wall to where it starts.

6. Draw another line from where the ball hits the wall to where it finishes.

7. Which line do you think could be called a line of reflection?

The teacher taught the above activity by just drawing on the blackboard a line of reflection.

In the above observations the lessons were teacher led, the classroom teaching pattern was dominated by teacher requests for information and students giving information mainly in Samoan. In both classes teachers asked questions based on the activity to which students already knew answers. Observing these classes motivating students for learning was in the form of explanation by reading from the blackboard. My focus has been on the development of interactive approaches used by the teachers in the classroom. However, the teachers need to plan and organise activities to keep the students engaged in actual learning. As I observed that when students were directed to do written works or copy down the notes they did not approach their teachers for any of their concern or needs. Students were not encouraged to ask questions.

Teachers are trained at NUS in a teacher directed style, though they are encouraged to use student-centred approaches when they go out to teach. It is very important for teacher educators to look at the way they teach courses that are offered for the trainees, so they model effective teaching practice. In the teacher dominated classrooms there are few opportunities for interactive work (Lameta, 2000). The teachers indicated that the students had language difficulties when learning in English.

The language of communication in the science classroom is important. Lee- Hang and Barker (1996) highlighted the disparity between secondary schools' language policy and practice of the classrooms. Although most classroom teaching is in Samoan, the Year 8 examination is in English except for Samoan language. The academic English language required for learning and performing successfully in examination will not have been achieved by many students because of the use of Samoan.

3.10 Interview with the Participants

Despite the preparation for the interview for this research project, I formally asked the participants' to sign the consent form (Appendix 2) and returned and arranged a time for the interview. Questionnaires were given to the participants prior to the interview (Appendix 3). These included a section of background information including number of years teaching and position in the school. Another section asked teachers about their use of PEMP books and planning activities for daily lesson plans. Finally they were asked to provide open-ended comments on teaching Year 8 Science. Participants also expressed their views about the courses that they took at NUS. Once the interview started I switched on my tape recorder. Seeing these participants several times helped me to strengthen mutual trust and friendship. I was heartened by the openness of the participants.

According to Richards (2005) an often ignored requirement of qualitative researcher is that the researcher must be ready for data. I was pleased that I had taken the time to establish guidelines. Each participant was interviewed at different times. One of the participants asked me to turn "off" the tape during the interview. This participant was concerned about whether his interview could be used for staff appraisal. I assured him that the findings from this study are to help teachers in their professional development. Participants were aware that I was recording in my journal too. The data collected during the interviews and observations provided an element of triangulation thus increasing the validity of the research. Interviews took more than an hour with each participant.

I transcribed the interviews verbatim and each member had the opportunity to check the transcripts. According to Silverman (2001) the checking of data is important; otherwise the data would have been lost, thus possibly compromising its validity. Although it took

considerable time checking the data I found out participants didn't provide any answer for few questions.

3.11 Analyzing the Interviews

The participants were allowed to check the interview transcripts for validity. The interview sessions were carried out at 3 different locations. According to Bell (1987) the interview gives the researcher room to follow up ideas, probe responses and to investigate inner motives and feelings. According to Ramanathan (2001), interviews are personalized and therefore permit a level of in-depth information, gathering free response, and flexibility that cannot be obtained by other procedures. I was grateful for the cooperation offered by the teachers during interviews. One of the purposes of this research and the reason it was carried out was that there was a need to find out teachers' perceptions about the use of resources and the PEMP books in teaching science in Year 8.

3.12 Identification of Issues from Interviews and Observation

I anticipated that the rich descriptive data from the classroom observation, questionnaires and in-depth interviews would be collated to analyze and triangulate the data. The methods of data analysis in this study were informed by the qualitative research approach of Bogdan and Biklen (1992). Data for questionnaires were analyzed across groups depending on the teachers' views in all aspects namely, Science and everyday preparations, use of PEMP books and the use of resources. I read the transcripts several times to familiarize myself with the information. At the same time I made notes, trying to trace connections. The transcriptions were analyzed for thematic content. These themes were then used to provide insights concerning the role of teacher preparation and the courses offered at NUS, that is the implications for initial teacher

education. The relevant literature was re-visited throughout the data collecting processes and this helped to provide further insights into the data and data interpretation.

This research methodology has allowed me to analyse sufficient research data that may be helpful in determining the future of courses that are offered at the NUS. The next chapter presents the findings.

4. RESULTS

This chapter presents the research findings focusing on the participants' responses and my observation of the science teachers of their various approaches in the classes. The interview responses of three participants are drawn and these justify how teachers approach Year 8 examinations and their preparation for them. This chapter is in two main parts: Part one discusses the data under the heading interview responses and how they addressed the research questions of this study. Part two discusses the classroom observations and teaching methods by each participant.

4.1 Summary of Interview Responses

In Samoa, teachers assume that success in classroom learning is shown in the examination results. The nature of teaching and assessing in Samoan classrooms is such that rote learning and low level outcomes would be expected. Table 1 indicates the final exam scores of all the year 8 subjects. As shown in the Table 1 the number of students who sat Year 8 science National Examination in 2006 was 4171 and the average raw score for science was 33 (which constitute a fail grade). A number of perspectives on the success of learning in classrooms are an outcome of the interaction between three important areas of development: academic, cognitive, and language (Collier, 1994). Academic development includes knowledge and skills of how to get the task done. Cognitive development is the mental processes associated with different learning areas, this includes knowledge of language and the skills necessary to combine the required task. All these areas are considered dependent on each other and need to be developed simultaneously.

The policies developed by the Samoan Education Policy and Planning Committee are very clear in their goals. Educational policies (1995-2005 Western Samoa Education Strategies) state that teaching will encourage “activity based learning programmes with an emphasis on problem-solving skills” and will promote “frequent testing and monitoring using varied forms of assessments. In the formulation of these policy goals, MESC targeted concepts like quality and relevancy in the area of teaching. The cause of declining achievement in Year 8 examination in Samoa from 2002-2005 is the subject of educational research at the FOE and MESC (Sooaemalelagi, 2005). The questionnaires that I provided for the participants targeted how teachers used the PEMP books for activities and planning lessons. Teachers were also encouraged to describe their concerns in actual teaching practice.

4.2 Summary of Interview Responses

The views presented were the teachers’ responses from their interviews with me. The teachers answered questionnaires designed that were distributed prior to the interviews. This study investigated the teachers’ perspectives about teaching science in Year 8 classes in Samoan schools.

This section presents the responses and illustrative quotes from the teachers for the interview about the use of PEMP books. The questions which expected long answers were provided in order for the researcher to collect abundant information. Furthermore, the teachers were asked by the researcher to give further opinions apart from what were expressed during the interviews. This section also briefly discusses these responses to each question and the related issues and challenges facing teachers teaching science in the Year 8 classes in Samoa.

Table 4

How do you describe learning?

Responses	Illustrative Quotes and Examples
• Apply new learning into life • Show your understanding by doing right	• Teacher 1 said this –*in the class students keep plastics and papers in two separate bins* Teacher 1 elaborated saying this was because he had taught the class biodegradable and non-biodegradable substances.

As a researcher and as a teacher if the students can apply what they learn in the class it is a great achievement.

Table 5

How are PEMP materials useful?-

Responses	Illustrative Quotes and Examples
• All participants thought PEMP books are handy. • Descriptions given in the books do not provide all the information to teach some lessons • We have limited background knowledge in science • Teachers need the teachers manual so that teaching is made easier • Students don't have enough books so they have to copy down the notes. • Sometimes hard to do activities that are given in the book • Don't know the outcome of the activity	Some examples of not enough information in the PEMP Year 8 book includes, • *'Measuring energy in food- no explanation given on how to measure energy when a peanut is burnt'.* • Teacher 1 gave an example 'how to grow corn seeds in different types of soil, but no explanation on what types of soil and how to germinate corn seeds' • Teacher 2 was concerned about *how to make machines on page 48 –PEMP Year 8 book.* • Teacher 1 didn't know how *alcohol is produced from fermenting fruits and the reaction during fermentation*

Teachers need to get extra information, encourage them to participate in professional development programmes that can include teaching methods for the improvement of student learning.

Table 6

How activities are carried out in the class?

Responses	**Illustrative Quotes and Examples**
• Don't have the equipment needed to carry out in the class • Limited resources and equipment • It is time consuming to carry out activities	All three teachers said they do not do all activities because equipment are not available Teacher 2 said school is not providing basic resources needed like *filter paper, funnel, thermometers, evaporating dish, gas burner etc.*
• carry out activities for some lessons	Teacher 1 gave these examples for simple activities that are carried out in the class, like *air has weight*, *soluble and insoluble substances*.
• Students make lots of noise in the activity time	Teacher 2 also said when he was taking students outside to look at flowers the students were laughing and giggling and not paying any attention.*' I was not happy about that'*
• "Teach" the whole day in a class so no time for preparation	Teacher 3 teaches English, Samoan, Maths, Science and Social Studies in the Year 8 classes. He said " *I don't have any free period a day, so less preparation for science lessons* "
• Students ask more questions during activity • Year 8 exam questions are based on activity • Not many activities carried out in the class may be a reason for poor Year 8 results	

All three teachers expressed some reluctance or hesitation in conducting science activities with the students. Learning must be an active process, encouraging students to take part in the learning by doing.

Table 7

Do you prefer to teach in English or in Samoan?

Responses	Illustrative Quotes and Examples
• Preferred to teach in Samoan, because students understand better. • We have to write down the notes in English • Hard to translate notes into Samoan • Easy to copy down from the books • Year 8 exam is in English	. Teacher 2 said this *'it is easy for students to follow when I teach in Samoan'.* Teacher 3 commented '*If the year 8 exam is in Samoan students may be able to answer better'-*

The discussion following this question of language in teaching science found that all three teachers commented students are more likely to share their thinking in a climate where they feel comfortable to express. During my observation as a researcher I have noticed all the three teachers were teaching in Samoan. As teacher 3 stated, the difference in the language of teaching and language of examination is likely to be a contributing factor in poor examination results.

Table 8

How do you plan your science lessons?

Responses	Illustrative Quotes and Examples
• Look at the PEMP books and write down the weekly plans. • Sometimes write activities in the plan, but not all the time. • We plan lessons with other teachers who teach in other Year 8 classes. • Cover all the topics in the PEMP books before the Year 8 exam • Principals need the plans every week, so submit every Friday	• As a researcher I had looked at the lesson plans of teachers 2 and 3, they had explained activities in the. lesson plan as it was in the PEMP text • Teacher 3 had written very briefly: 'show the class different types of soil' When I asked about this, teacher 1 said that to demonstrate this he would *"ask two students to go outside and bring some soil'.* • Teacher 2 had this written in the plan- 'teach the class reflection'.

• Being a teacher for than 5 years don't really look at lesson plans when teaching • Do not have any other reading materials for students • Students depend on our notes • Students are reluctant to ask questions. They accept our knowledge	

Teachers' plans didn't include resources to provide a breadth of learning experiences. The improvement and enjoyment of teaching and learning in science lessons can be attributed to the supply of appropriate resources and the use of new teaching skills.

Table 9

The types of assessment practices that are carried in the class

Responses	**Illustrative Quotes**
• Assignments, • Home work • Quizzes	• As researcher I have noticed science questions written on the newsprints. Teacher 1 had these written on a news print. • *What are the characteristics of living things?* • *Name main parts of a flower?* • *What do you mean by herbivores?*
• Role play,	• Teacher 2 said role plays are carried out when teaching ' environmental pollution' '

Considering all the responses from the 3 teachers regarding assessment, asking questions to the students was the preferred form of assessment. The assessment tasks were not shown in the plan. Teachers need to focus also on formative assessment where students are given feedback regularly. In that way it is easy to assess each individual student's progress.

Table 10

Science courses taken at NUS during training

Responses	Illustrative Quotes
• We need more Science courses in the training program • Want to upgrade our qualification, but hard to find time after school. • Prepared to come to NUS on summer vacation time. concentrate only on the courses • Like to carry out activities but not sure of the outcome. We can learn more about those activities if we take courses at NUS • Want to improve content knowledge in science • Include more activities in the courses at NUS • Include different methods of assessment in the course	• Teacher 3 wants to learn more on assessment. This is his comments. '*In Year 8 Examination paper there are different types of questions, I find difficulty to write questions in Science'*. • Teacher 1 had this opinion- "*when I did my training at NUS I took only one science course I didn't get enough understanding from the course that I took".*

Faculty of Education (FOE) programmes have very important roles in developing scientific skills so that teachers become aware of the importance of these skills and try to improve their students' skills when they start teaching.

Considering the responses about using PEMP books, the participants highlighted the need to receive more support in both content and teaching skills which will enable them to plan lessons effectively. Teachers should be encouraged to enrol in professional development courses that promote active teaching and learning and student participation in science lessons.

4.3 Content of Responses

The responses from the three participants were gathered while viewing their questionnaires about the use of PEMP texts in the teaching of science. As seen clearly from the responses, teachers depend mainly on the PEMP text book for planning their lessons or using it as a resource for teaching. Students have limited access to any other source of information other than the teacher. It was clear to see teachers' commitment to complete the prescribed science curriculum for the National Examination. Teachers agreed that they were not confident with the science content in the PEMP books as well as methods to enable them to transfer this content into the classroom. The interview responses were put into 3 main groups.

- Prescriptive nature of curriculum
- Teachers' content and language knowledge
- Assessments

Now I discuss each of these further in the following sections.

4.3.1 Prescriptive Nature of Curriculum

Curriculum is a body of knowledge that all children are required to learn. Science is one of the compulsory subjects in the Samoan curriculum and students up to Year 11 are required to learn science. There is, of course, much debate in Samoa about what should be included in the core content of each subject. The breadth and depth of content are largely dictated by the demands of the examination related prescription. Primary school teachers in Samoa are expected to teach all the subjects in their respective classes. One of the issues raised by my participants was that the science content is too difficult and that there are no resources or no other science teachers to deepen and broaden their understanding of science content knowledge. The participants are all teaching Year

8 classes. It is often claimed that experienced teachers often teach in Year 8 classes. These are some of the comments from the participants.

‘I only read the part molecules and atoms, elements and compounds but I can’t explain’.

‘I don’t like to teach body systems because I hate drawings’.

‘We don’t have a photocopier in school to take copies of diagrams’

‘If I get a chance to upgrade my qualification, my content knowledge can be improved’.

These comments indicated that the teachers felt that they did not have sufficient content knowledge to teach some topics. As Hand (2004) noted, laboratory activities and reports have traditionally been “prescriptive” in nature and mainly become an exercise in memorization. As science educators in Samoa we teach science courses as independent, specialized classes that do not encourage students to explore and construct their understanding of science. Teacher attitudes about specific subject matter also influence their approaches to the issue of quality teaching. The Waikato University group in New Zealand had undertaken research on new pedagogies in science education. They have indicated that teacher development is required before the new pedagogical approaches can be implemented. Some aspects of pedagogy include teachers’ views on teaching, learning, planning and the nature of science (Bell, 2003). One participant confirmed that teaching methods taught in the pre-service training had been worthwhile but teachers needed more practical courses for the improvement of student learning.

4.3.2 The Language and Content Knowledge

In 1999, the Samoan Department of Education in a joint research project with UNDP, embarked on a major Samoan language study in primary education to document the

current language practices in all the primary schools in Samoa. One of the major aims was to collect data to inform the development of overarching language policy for the both primary and secondary schools in Samoa. This was presented in a public seminar for all stakeholders (Lamata, 2000). The public supported a change in the current language policy so that students could be exposed to the English language at an early stage of Year two instead of Year four (Lamata, 2000). This policy is based on the "maximum exposure" proposed by Cummins (Cummins & McNeely, 1987) for students whose mother tongue is the majority language. These students need "large doses of education in their second language". Samoan parents also prefer their children to be taught in English so that they have better employment prospects (Pereira, 2002). A concept that describes the high risk of failure during National Examinations may be because it is conducted in English.

One of the participants expressed this concern,

> Explaining science in English is not easy. More than half of the time I speak and teach in Samoan because I feel comfortable to teach in Samoan.

Further comments on this language issue include:

> Students respond better when asked in Samoan.
>
> I prefer mathematics than science, because I don't understand science concepts. If it is written in Samoan may be easier for me.

4.3.3 Assessment

Raising the standards of learning that are achieved through school education is an important national priority in Samoa. The government has taken vigorous steps in the last ten years in providing professional development for both pre-service and in-service teachers. Initiatives to improve national curriculum testing, school planning and

management are more frequent through professional staff development. Participants also expressed their concerns about assessment. The role of teachers' assessment in National Examinations is a particular issue. All teachers assess in every class they teach, in order to provide feedback to modify the teaching and learning activities in which students are engaged.

When I asked the participants about more detail on assessment, they provided different views. One participant thought tests were the only form of assessment. Another thought all writing in exercise books could be considered as assessment. The giving of marks was over-emphasized while the giving of feedback and useful advice are under emphasized. When I talked with my participants, one commented:

"*Assessment feedback teaches students with low attainments that they lack 'ability', so they are de-motivated, believing that they are not able to learn*."

It is interesting that this teacher did not see that formative assessment could be used to inform next steps in learning. Feedback to the students should be about the quality of his or her work, with advice on what he or she can do to improve learning. In Samoa, primary teachers particularly tend to emphasize neat presentation of work and to neglect its quality in relation to learning (Pereira, 2002). The main concern of this research study was for assessing students in the Year 8 National Examination for placement in the secondary colleges.

4.3.4 The Purpose of the Classroom Observation

The purpose of the classroom observations was part of this study to help focus on science teaching methods and the interaction amongst teachers and students in the classrooms. Many hands on approaches have stemmed from the PEMP science

curriculum books and all the teachers observed were using these books. The classroom observations were also conducted in order to visualize and see how students interacted with teachers during normal science classes. Teachers had well-ordered classes and taught in a relaxed manner which was a pattern that characterised all the three classes that I observed. Teaching styles were the same with the 3 teachers that I have observed and some common features of the classroom observation including:

- Modes of delivery
- Language of communication
- Broad practice of Samoan traditions

I will now discuss how these aspects influence teacher delivery.

4.3.5 Modes of Delivery

There were no significant differences in the styles of teaching among the three teachers. A particular feature of talk between teacher and students is the asking of questions by the teacher. Concerns have been raised regarding the low emphasis placed on activities that are covered in the lessons.

4.3.6 Teacher One

When Mr. Pone started his class he asked the students to move to the front and asked them to sit on the floor. Mr. Pone started the lesson on the topic “light”. Students were all quiet and paid attention in the class. No one talked or misbehaved in this class. Pone asked several questions both in English and in Samoan. It was hard for me to see who was not responding to the questions. Some examples of questions were: What is light? How shadow is formed? What is reflection? Name a luminous object. These are all factual recall questions. The teaching was mainly with chalk and blackboard. After the

explanation the teacher asked the class to copy down the notes that the teacher wrote on the board from the PEMP book.

Students then returned to their seats to copy down the notes and students spent 20 minutes for that. There was hardly any interaction between the students and the teacher, nor interactions between students. The lesson lasted for 50 minutes. After the lesson it was recess time. The teacher was concentrating on the knowledge of scientific facts attempting to cover topics mainly by recitation mode.

4.3.7 Teacher Two

Mr. Afa started to revise what he had covered in the first two terms of the year. Students were all seated on their seats. Afa was revising 2004 Year 8 National Examination paper and started to read questions one by one. For every question Mr. Afa read, he referred to the PEMP topic that the students had covered. The teacher gave out the answers for each question and explained the answers clearly both in Samoan and in English. This continued for half an hour. After that students copied the questions and answers into their science exercise books for another 20 minutes. The students could do their work in a group more freely rather than copying the questions and answers individually. Encouraging students to copy the answers indicates the clear emphasis on developing strong content knowledge.

4.3.8 Teacher Three

Mr. Mike's students were seated on the floor and he started the topic on "heat." He asked questions and the whole class gave out answers in English. Questions like what is "conduction and convection"? Give an example for conduction. Students gave out the answers from their notes. This repetition continued for half an hour. Then the teacher

wrote an activity on the board from the PEMP material and students copied from the blackboard. The lesson lasted for 50 minutes. If Mr. Mike had used activities it would be beneficial to students' learning. It appeared that the teaching style of Mike was not any different from the other two teachers.

4.3.9 Mode of Delivery -Questioning Techniques

By observing the teachers, I discovered that the modes of delivery, especially questioning techniques, were the same. I was surprised to see the extent to which the teachers dominated the class situations. As teachers planned, they did not sprinkle some thought–provoking questions throughout the lesson to keep the students involved, rather than sitting as passive recipients. Asking students good questions can result in their active engagement in class. Good questions motivate students to stretch their own understanding of what is being taught. Teachers need question-based problem-solving strategies that are adaptable to different students, and productive, and transferable (Richeti & Sheevin, 1999). One common problem that I have noticed was teachers did not allow enough time for students to think after asking a question and for them to offer an answer. Instead the teacher tended to answer his own questions after two or three seconds, where a minute of silent thought was not tolerable. There are two consequences of this; one is that the only questions that can produce answers in such a short time are questions requiring factual answers like the ones I have observed such as "What is conduction? What is reflection? Name 3 types of soil? Name an insulator". The other is that, students did not even try to think about responses. Only a few students in the class answered questions. It is possible that the rest thought they could not respond quickly enough and were unwilling to risk making mistakes when someone else was observing.

Brown and Edmondson's (1984) conducted research to investigate what questions teachers ask and why they ask them. They recommended that teachers provide students with models of good questions for students to observe, discuss effective questioning strategies, give students opportunities to practice questioning, and provide students with feedback on their questioning.

Instead of viewing science as a body of facts to be learned, science may be viewed as a structured and direct way of asking and answering questions (inquiry) on the topics. In the topic 'light' that I observed as part of this study, the relatively simple concepts are: transparency, opaqueness, reflection, refraction and shadow. Children can understand these concepts by participating in simple activities.

4.3.10 Mode of Delivery-Talk and Listen

Hands on activities are clearly described in the PEMP books, where teachers telling or writing on the blackboard, students should be given the opportunity to explore to generate interest and prompt questions related to the topic. Hands on curricula will be used to put students more in control of their learning by encouraging individual student inquiry into thinking about relevant phenomena. Additionally learning resources will be utilized to help remove teachers from transfer of information approaches to becoming effective facilitator for creative and critical thinking.

There is evidence from my observations that much of the teaching in these classrooms amounts to "telling" which students may not find very motivating. When teachers ask mostly low-level questions (e.g., define, describe, name), student achievement does not reach levels that are as high as those reached when students are asked higher level

questions (e.g., predict, evaluate, justify) (Redfield & Rousseau, 1981). Teachers transmit knowledge to students who do not construct new understandings instead students reproduce this teacher transmitted knowledge during tests and exams. A constructivist view of learning in contrast, would promote the pedagogical role and usefulness of students' questions in the classroom. Biddulph (1989) argued that pedagogy to promote learning of science using the children's own questions is very important to support student learning.

4.4 Language of Communication

The most significant finding from my observations was that Samoan language was used frequently to teach, to evaluate and give instructions. This is in contrast to the fact that school curriculum books are written in English and are used for school work. Given that language plays a crucial role in teaching and learning process, the mismatch causes tensions and difficulties. All the three teachers were teaching in Samoan more than three quarters of the time and wrote the notes from the PEMP books on the blackboard in English. The focus was clearly student learning and teaching for understanding. Students were engaged in copying notes without misbehaviour. I did not observe any informal interactions or formative assessment strategies to monitor student understanding of science concepts throughout the lessons.

The present practice within schools of introducing English as a subject from Year 4, and then as the language of instruction from Year 7, is in fact not in accordance with national policy goals of producing bilingual individuals. This practice is an effective way for bilingual speakers of Samoan and English to communicate. Teachers agreed that teaching was as they described, "chalk and talk" and lots of copying from the

blackboard. The culture of the society in Samoa may be another influencing factor. Some educators have noted the links between teacher-centred pedagogies and Samoan culture and social structure (Tanielu 1997., Tuia 1999). The vision for Samoa's education system is bilingualism.

The teachers indicated that the students had language difficulties when learning in English. The language of communication in the science classroom is important. Lee-Hang and Barker (1996) highlighted the disparity between secondary schools' language policy and practice of using the Samoan language in classrooms. Although most classroom teaching is in Samoan, the Year 8 examination is in English except for Samoan language as a subject. The academic English language required for learning and performing successfully in examinations will not have been achieved by many students because of the use of Samoan.

There is a great uncertainty with the language policy within the Ministry of Education Sports and Culture (Afamasaga, 2002). The Department of Education ten-year policy document (1995-2005, p.34 Western Samoa Education Strategies) defines the aims of education in Samoa which also highlighted a desired outcome of the system as "the production of bilingual individuals, fully literate in both Samoan and English".

Currently, the department of MESC is concerned about the English language skills of students. The Department of Education (1995-2005, p34 Western Samoa Education Strategies) policies document has this statement:

> "The absence of a systematic bilingual methodology and teachers who lack bilingual facility, mean that most students are linguistically disadvantaged".

4.5 Broad Practice of Samoan Traditional Approach

A traditional approach to Samoan curriculum emphasizes excellence in achievement that is often backed up by tests and examinations. This is the way the education system was operating, especially with its examination-driven curriculum and its elite system. The use of examinations in Samoa in the formal education system has been both extensive and intensive in its application and decision making; extensive given Samoa's involvement in the formal education system the establishment of curriculum unit in the 1970s; intensive considering the sheer number of examinations a Samoan student would need to sit before graduating from both primary and secondary schooling. At least three of these examinations in Samoa are considered high stakes tests. The Year 8 National Examination is an example of such a high stakes test and as a researcher I gathered information from the teachers about how they coped with the curriculum. Teachers also indicated that they, as teachers, are often judged by the performance of 'their' students in these exams.

4.6 Strength and Weakness of the Traditional Practices

After working with my participants it became apparent that Samoan culture is central to their everyday work. This confirms what was found in a previous study by Wilson and Hunt (1998). I could, however see that authority plays a major role inside the classrooms. For example teacher – centred pedagogies where students are given very little chance to ask questions predominate. The assumption is that developing and maintaining control of your classroom requires authority. These teachers decide what is acceptable to help their students meet the goals they have set for them and the school delegates responsibility and grants teachers the authority to act in accordance with that responsibility. Therefore, students must respect this authority (Froyen, 1998). In Samoa,

teachers are considered as the sole source of authority and knowledge, while children have limited rights and should not ask questions or express likes and dislikes (Pereira, 2002).

The best way to learn science is to do science. Students need to have a chance to ask questions, do investigations and learn to apply the findings to their everyday life situations (Charlesworth & Lind, 1995).

Observations of science classes and discussions with the participants showed traditional teaching as the trend. Classrooms were teacher–centred with little development of student thinking or communication skills either teacher-student interactions, or student-student interactions. Students were generally viewed as passive recipients in the class. The teachers believed and acted on their beliefs that teaching and learning involves the simple transmission of facts. Students were seated at separate desks facing the teacher at the front of the classroom. I have noticed the same trend in all three classrooms that I observed. Rather than being encouraged to ask questions students were mostly required to listen and copy exactly what was on the board. Discipline was generally not a problem. The one reason given for lesson formats being very rigidly structured and the classroom being teacher–dominated was that the primary goal of education was for students to pass Year 8 National Examination i.e. being able to repeat facts and interpretations. Therefore there is a very strong emphasis on learning content knowledge.

4.7 Teachers Concerns

Teachers expressed concern over their lack of content knowledge in science when preparing and teaching science. It is important for science teachers to plan topics in detail with enough background information to ensure the effective and efficient content for each topic. The Year 8 National Examination is presently the only method of assessment for students entering at Year 9 level into secondary colleges in Samoa (1995 Western Samoa Education Strategies). Students perform these examinations in English and they are taught in Samoan. My participants were concerned about their students' English ability. If curriculum development and teacher development are seen as interrelated, then teachers' professional development must be part of national curriculum policy.

4.8 Outcomes

In a world that is fast becoming culturally standardized, students need to develop and understand the application of knowledge and skills to play their part in a competitive world. The language in science issue is a very important area that needs to be thoroughly addressed because educational research and efforts will be wasted if this is not addressed. The teaching learning process in Samoan classrooms is summed up in the following acknowledgement by the MESC in their ten-year educational policies document (MESC, 2006 -2015 Strategic Policies and Plan).

> An over reliance on rote–learning methods, and a general lack of creativity in classroom approaches limit learning possibilities for teaching and learning in most subject areas.

Researchers conducted a number of studies in the area of students' language difficulties in education. A research study conducted by McKinley, McPherson and Bell (1992) stressed the importance of using more culturally appropriate teaching, learning and assessment activities in science, in order to improve achievement and cultural connectedness of Maori students in New Zealand. Teaching science, in meaningful contexts for students, has been an emphasis in the 1990s in New Zealand national curricular developments. New Zealand teachers frequently used practical work, especially structured student activities and open investigations, for developing practical skills as wells as for conceptual understanding (Millar & Driver, 1987).

Osborne and Freyberg (1985) documented their work in the Learning in Science Project (LISP) which also explored the language issue in the science classrooms. McKinley (2000) explored the interaction between language, culture and science education with regard to Maori people in New Zealand. Back in Samoa studies by Lameta (2000) Lee Hang and Barker (1996) illustrate the importance and communication in the science classroom. It appears that Samoan language is an effective medium of teaching and learning in most primary and secondary schools in Samoa (Lameta, 2000).

As a researcher I was left to conclude that in the traditional classroom, teachers see their function as to cover the set curriculum, but there is a need to create situations where students are able to bring their cultural experiences to the learning context. The problem is further compounded when the classroom teachers themselves have inadequate language proficiency in English (Pereira, 2002). It appears that teachers have to be more diligent in developing their English language proficiency and recognize what they need to learn and what they need to do to improve. The approach to rectify

this issue requires a collaborative effort from the MESC alongside the pre-service and in-service training providers at the NUS.

5. DISCUSSION

This chapter discusses the findings of the study from the teachers' responses and classroom observations. The main focus of this research has been on pedagogies to promote classroom interactions and effective communication between teachers and students. In doing so, it has incorporated the belief of teachers about teaching and learning. I also explored teachers' definitions of how children learn science and what "doing science" means. Based on the responses from the participants, heavy emphasis is placed on science content.

All the participants emphasized traditional teaching environments in which teachers gave the information and students received information, whenever they were taught. Participants' perceived students as passive knowledge receivers. As part of my research study I have come across teachers' traditional beliefs and its influence on teaching. The teachers' perspectives and beliefs about teaching have produced some concern in this research. The findings of this research have been helpful in identifying teachers' beliefs about teaching science in traditional Samoan classrooms.

5.1 Teachers Belief about Teaching - International Findings

Teachers' beliefs about students' learning, the nature of science and science education, epistemology, curriculum, students' parents' expectations and the role of teacher affect the way that science teachers teach (King, Shumow, & Lietz, 2001). In order to develop more effective teaching approaches teachers' beliefs play a major role in defining teaching tasks and organising the knowledge and information relevant to those tasks. Knowledge and beliefs are intertwined. According to Shulman (1987) research on teachers' knowledge suggests that both teachers' subject matter knowledge and

teachers' pedagogical knowledge are crucial to good teaching and student understanding. Wolpert (1997) pointed out that 'science is a special way of knowing and investigating' and the only way to appreciate the process is to do it. From my findings this is not the case in the primary schools. One reason is the lack of knowledge of teachers to implement student-centred approaches in the schools in Samoa.

International research confirms that teachers are critical in lifting student achievement (Hopkins & Stren, 1996). Woods (1996) speculates that when teachers' beliefs are very tightly interconnected with other beliefs, they are difficult to change. Changing how teachers think about teaching and learning is a challenging process for teacher education programmes.

Researchers observed that there is more than one way to teach science successfully, supporting the preposition that teaching is culturally and contextually based. Australia conducted a research study to identify characteristics of science teaching in Japan and Australia. The lessons in each of these two countries shared two features. One, lessons in each of these two countries had high content standard and high expectations for students' learning. Secondly, rather than exposing students to a variety of teaching methods and content, the science lessons in each higher-achieving country reflected a common core instructional approach that was content-focussed. The style of teaching in both countries tended to focus on engaging students in practical activities that were followed by discussion of results and a conclusion. In contrast to Japan, Australian science lessons supported the development of science ideas more often with real-life examples but less often with visual representations. The Australian model of science teaching provided students with many opportunities to practice several scientific inquiry skills such as interpretation of scientific data. Rich teacher-student interactions created a

stimulating environment, encouraged students to explore ideas and approaches and allowed for teachers to monitor individual students according to their individual needs (Pressley & McCormick, 1995).

5.2 What are Traditional Beliefs of Samoan Teachers in Teaching Science?

Observations of science classes and interviews with the participants showed traditional teaching as the predominant approach. Classrooms were teacher–centred with little development of student thinking or development of student communication skills. Students were generally viewed as passive recipients in the class. Teaching was simply the transmission of facts. Students were seated at separate desks facing the teacher at the front of the classroom. I have noticed the same trend all the three occasions in the classrooms that I have observed. Rather than being encouraged to ask questions students were required to listen and copy exactly what was on the board. Discipline was generally not a problem. The one reason given for the lesson formats being very rigidly structured with teacher–domination was that the primary goal of education was for students to pass the Year 8 National Examination. Therefore it is only natural that teachers would want to ensure students were well-prepared for the exam questions. The assessment system in Samoa currently values rote learning so teachers align their teaching to this.

Teachers in Samoa have not fully understood the benefits of learning by doing and are hesitant to use participatory methods of learning. One of the responses from a participant was that *"science activity is time consuming".* Scott (1998) argues that teachers' lack of awareness of the importance of active participation influences the type of learning children experience. Further, teachers' lack of knowledge about how to implement participatory methods is the main reasons for this lack of awareness, i.e. they have not seen how students can achieve through participatory methods. During my

classroom observations of teachers teaching, the two most common types of activities were factual questioning where students knew the answers, and copying notes from the blackboard. When the nature of similar activities were considered in more depth, they showed children's involvement in the learning process was at the surface level of being able to say what something was (Lameta, 2000). This was the case in all classes that I observed.

Innovative methods need to be devised to bring the necessary changes to the traditional system of teaching in Samoan classrooms. One of the responses from participants on planning activity was that –'*if we carry out activities in the class, a lot of time is wasted for teaching'*. Teachers are in a hurry to get the facts across, rather than taking time to develop sound thinking procedures which will help students make better sense of the topic they learn or to learn to transfer learning processes to new topics. Despite the effort made by most teachers at the Year 8 level, such as afternoon classes and increased revision time, the results of past Year 8 Examination in Samoa, indicated that we are not achieving high quality in our teaching (Table 2).

5.3 What are Teachers' Beliefs about Learning in English?

A key finding from my observations was the lack of students' ability to express themselves in English. This is a great concern. The current language policy states that English is the medium of instruction from Year 7 onwards in all government primary schools. All the three teachers that I observed had the same response regarding learning in English-'*students understand better if taught in Samoan'*. In reality many teachers still instruct in Samoan. While visiting schools to talk to my participants recently to discuss my research, I heard and observed mathematics and science lessons being taught in Samoan. Even the teaching of the subject English used Samoan as the

language of instruction. There is disparity between the MESC policy and practice. If this practice continues, students continue to be disadvantaged. Students' difficulty with communication in science is becoming widely recognised and supported by local researchers (Esera, IF 2001; Sooaemalelagi, 2004).

This study documented that both teachers and students are using both languages in the teaching and learning of science in their classes despite the existence of the 'English only' language of instruction for Year 7 onwards is the policy for schools. MESC promoted "the systematic presentation of essential knowledge by means of a sound bilingual methodology" (1995-2005 Western Samoa Education Strategies). Teachers ignore this policy and prioritise Samoan as a medium of instruction. On closer inspection it would seem that the current bilingual methodology practised by most teachers, as well as the impact of high stakes testing in Year 8 and learning styles fostered and practised by students in the primary schools in Samoa, are some of the contributing factors that make it more difficult for students to achieve well.

5.4 What are Teachers' Beliefs about Qualities of Effective Teachers?

This study also investigated teachers' preparations and classroom practices. I was particularly concerned about how these influence quality learning in the classrooms. My observations indicated that teachers did not encourage students to ask questions while teaching. Also students did not approach teachers for assistance nor were they encouraged to do so. The teachers interacted with the students on a one- -to-one basis very little. Teachers showed little interest as to whether students understood how or why an answer was reached. Frequently, students copied work from the board that had been written on the board by the teacher from the PEMP book. For the most part, teacher initiated question-and–answer techniques which were recall based and did not require

the students to develop thinking skills. Participants' lesson plans did not reflect any emphasis on student-centred activities or resources.

The teaching and learning of science can be a challenge for both teachers and students. Students can find it challenging to understand concepts in science textbooks. Learning outcomes are directly linked to the capacity of teachers to facilitate flexible learning through their knowledge, professional expertise through relevant methodology and proper and adequate resources. Research indicated that the most common reasons for teaching cited by good teachers are having an interest and excitement about the process of teaching and having a desire to perform a valuable service for society (Myers & Myers, 1995). Good teachers explained what the lesson was about and did more than merely write the activity on the board but direct students to do work (Pereira, 2005).

In Samoa there are disparities between MESC stated policy and classroom practice. Educational policies (1995-2005 Western Samoa Education Strategies) state that teaching will encourage *"activity based learning programmes with an emphasis on problem-solving skills"* and will promote *"frequent testing and monitoring using varied forms of assessment".*

5.5 The Current Trend and the Use of PEMP Text

This study also investigated the use of PEMP textbooks by the three participant Year 8 teachers. The PEMP texts were frequently used and were the only resource used by the participant teachers. A critical component of teaching is the teachers' creation of situations that stimulate students' curiosity and interest in the class. All the three teachers' lesson plans did not provide evidence of any interactive approaches planned for their classes. Interviews revealed that the teachers faced obstacles to the

implementation of the interactive approaches which they had encountered due to lack of content knowledge, resources and support from the school. As a result the use of textbook-based teaching approach was adopted instead of creating time for hands–on practical approaches. Teachers decided it was important to try and cover the entire PEMP book before the Year 8 National Examination. The following is a quote from one of the participants -'Year 8 examination is based on the PEMP text, I need to finish teaching and enough time for revision'.

The responses of participants provide examples of the issue indicating how teachers found it difficult to use hands-on activities along with textbooks in science teaching and learning. The participants shared their difficulties in preparing class activities, so they resort to 'telling" in the class. There is a lack of availability of equipment, chemicals and audio visuals that are not provided by the school. The teacher though, could be thought of as an innovator to find new ways or alternative ways of doing things for the class.

As a science teacher I have noticed how the level of enthusiasm for class activities increases when hands-on activities are used and this has a positive effect on the attitudes my students have for science. It seems critical, however that the importance of hands-on learning must be included as part of the pre-service teachers training courses at the NUS. It would be even better if there was an orientation that views textbooks as being useful supplements to hands- on learning.

To encourage student-centred methods of teaching, students must ask good questions, design experiments, analyze results and draw conclusions. This type of learning requires students to take more responsibility for their own learning. They need to be more active and in identifying what they need to know to solve problems, acquire resources, set the

pace of learning, and demonstrate mastery. In this mode, students require less direct guidance and should be encouraged and supported to work more independently.

The PEMP text exists to provide background information for activities. Keeping science textbooks content current and enriching requires science teachers to develop professional growth patterns out of the teaching paradigm. Hands on science may allow a student to observe phenomena directly as a supplement to what is presented in the textbooks. At the start of a unit, an activity related to the topic in the text can act as a catalyst to get the mind and the body into the inquiry mode.

Teachers here in Samoa often think there are not adequate resources available for hands-on science activities. However, traditional textbook science programs must not be the only source of classroom learning. “For a good balance between structure and flexibility, discussing and experimenting, teachers must identify appropriate activities and integrate them into the textbook” (Padilla, 1990, p 38). Teachers, who depend only on textbooks, often wonder why their students are lacking motivation to learn.

There is a difference between teaching science from a textbook and teaching science as an inquiry. Engaging students in the process of doing science can make the textbook knowledge come alive as the principles it describes are applied to interesting problems. Students come to the classroom with preconceptions about how the world works. If students’ initial understanding is not engaged, they fail to grasp the new concepts and information, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.

5.6 How Students Learn Science in Samoan Classrooms

This study explored the teachers' methods of teaching science and the resources involved in teaching in Year 8 classes. I had hinted to my participants that my goal was to observe how they interacted with their students during classroom teaching. During my classroom observations when the teachers entered the class, all students were quiet and paid attention in the class. No one talked or misbehaved while the teachers were teaching. However, as mentioned previously there were very few individual interactions.

Often when teachers asked several questions both in English and in Samoan, the whole class answered as a group in Samoan. It was hard for me to see who was not responding to the questions. Teachers agreed that teaching methods as they described "chalk and talk", "traditional" "overemphasis on drills and practices" and "lots of copying on the blackboard" from the PEMP book and then students copied the notes into their note books. Teachers, the unquestioned authoritarian purveyors of accepted knowledge, were responsible for students' learning. All the participants had well-ordered classes, without encouraging students active involvement. Students are undoubtedly influenced by teachers' ways of teaching and were very compliant.

In a traditional classroom in Samoa, there are about 35-40 students. Therefore it is not practical for a teacher to work with individual students for long periods of time. While the students are working individually on exercises, teachers can talk to individual students and offer them meaningful suggestions. The ability to interact with individual students during the hands-on activities or class exercises can enhance the effectiveness of a teacher. Francis and Byrne (1999) found that participatory activities in the teaching of science deepen students' understanding when they learn in realistic meaningful contexts.

In Samoan classrooms there is limited interaction between teachers and students in the classrooms. Recent research in Samoa by Afamasaga- Fuatai (2002) into the low Samoa Primary Educational Literacy Level marks for mathematics at the primary level found that teachers who had poor background knowledge would rely heavily on prescriptive work cards or tests, giving students step by step instructions. It also came to my attention when my participants were teaching and during their interviews that they emphasised completing the science topics while neglecting conceptual development. Students had minimal opportunities to ask questions or to be involved in any discussions during the class. In Samoa, with its emphasis on examinations, the practice of whole class copying notes from the blackboard and adhering strictly to the text is perpetuated at all levels of schooling (Esera, E, 1996; Lameta, 2000). What is assessed drives what is taught and how it is taught.

I have found that the teachers seem to favour continuous repetition and whole class chanting during science classes. Students need guidance in linking their current experiences to existing ideas in long-term memory as they try to generate meaning. During my observations of science classes, responses given by students were simply memorised and showed very little expressions of the students own understanding for the most part.

Teacher education in Samoa has merged with the NUS in 1997 as a strategy to improve the quality of teachers and the quality of teaching in Samoa. If quality education is to be offered then teaching practises that encourage understanding and creativity must predominate in the classrooms (Afamasaga-Fuatai, 2002; Kohn, Linn & Matheson,

2000). According to Kagan (1992) the process of learning to teach and the practice of teaching are very important in teacher preparation programmes.

5.7 Training Model for Teacher Trainees

The findings of the study have relevance for the courses offered at the National University of Samoa for both pre-service and in-service teacher trainees. The teacher education programs provide curriculum knowledge, pedagogical content knowledge and knowledge of child development and some aspects of psychology. Teachers' beliefs about the importance of science teaching have a great impact on their practices in the classrooms.

When pre-service science teachers come to universities they bring many beliefs about science teaching and learning. These beliefs may result from their schooling experiences as a student in their schooling periods (Briscoe, 1991; Tsai, 2002). In Samoa, students observe and experience teaching from a "student-oriented" perspective, making "student judgments" about teaching. Students are not pressed to place the teachers' action in a pedagogically oriented framework. So, pre-service students continue to use their earlier "student perceptions" of teaching in their understanding of teachers' work. I am now realising pre-service teachers need to be encouraged and supported in becoming more aware of their subjective beliefs and current professional understanding about teaching and learning when they come to NUS. We need to challenge their beliefs more.

5.8 Implications of the Study

The findings of this study have important pedagogical implications for the teaching and learning of science in primary classes. This study has implications for the training of teachers and the courses offered at NUS for both pre-service and in-service teachers. It

has implication for the use of language in teaching and assessment instruments, which may be applicable to other subject areas as well. All these may have long term implications for Samoa's economy with regards to the development of a pool of scientifically literate and highly qualified humans as resources for the future.

5.9 Summary

In this chapter I have discussed related issues and beliefs that arose during the observations and interviews with the teachers. The next chapter draws the recommendations and conclusions of the study for practice as well as future research.

6. RECOMMENDATIONS AND CONCLUSIONS

This chapter summarizes the main findings of the study and suggests a set of recommendations to implement effective science teaching approaches in Samoan classrooms. The emphasis of this research has been to gather data on methods and skills in teaching science in Year 8 classes. The quality of teachers and pre-service and in-service training programs have come under scrutiny in this country. The findings of this research indicate that there may be reasons for concerns about the quality of science teaching and has found that Samoan educators need to be creative if they are to bring about a more efficient education process that is culturally correct as well.

The educational goals for Samoan students as set in the 2006-2015 education policies are for students to be innovative, creative and skilful in their enquiry methods (MESC, 2006 Strategic policies and Plan,). If these goals are to be realised, we need to develop these skills in students. Students' quality outcomes in terms of SPELL and Year 8 examinations results have continued to decline over the past five years. There has been major concern about poor performance on these examinations, especially in Science which has led to this research. The summary of the findings are given below.

6.1 Summary of the Main Findings

- This study documented that teachers need to develop more creative and innovative learning environments in their classrooms.
- The results of this study show that the teachers consider that the PEMP books encourage active involvement. However, very little interaction was observed between the teacher and students in the class. Teachers may need support to implement the intention of the activities in the books.

- Traditional practices such as concentrating on the knowledge of scientific facts and covering a number of topics mainly by recitation were common. This is not surprising since this is what is valued in the examination.
- Because science is taught in Samoan but examined through a National Examination in English raises questions about the validity and reliability of these assessments.

6.2 Approaches to Teaching and Learning Techniques

This investigation has provided information about how teachers approach science teaching in their classrooms. I have now a better understanding about types of practices and what teachers see in terms of their functions to "cover" the set topics before the Year 8 examination. In the traditional classrooms, there are distinct power differences between teachers and students. In these classrooms the predominant method was where the teacher did most of the talking and then wrote notes on the blackboard which was then copied by the students.

The PEMP books encourage teachers to use a range of teaching methods such as individualized activities, group activities, report writing and role play. It is critical that teachers provide more opportunities for pupils to talk to each other about what they are doing, to become more aware of their own ideas and those of their peers, and to modify their own ideas where necessary. Teachers need to know enough about the topics to be able to provide anecdotal information that will fill in the gaps and round out a class's understanding of a concept. Effective questioning techniques can actively engage students in the class. Good questions motivate students to stretch their own understanding of what is being taught. Questioning is also an active resource throughout the lesson to keep students in the right direction and to extend their thinking. Teachers

can find out what students need in a variety of ways from observation and discussion in the classroom and from the written work of pupils whether done as homework or in class as assessment. From my observations very little of these forms of assessment were employed in the classrooms. Most assessment was of the pen and pencil type with very little constructive feedback to the students.

Teachers want to create situations in which students see meaning in lessons and can make connections between what they learn in their classroom and the real world (Webb, Metha & Jordan, 1999). Learning experiences have three dimensions:

(1) what is learned (content)

(2) how the content is learned (instruction) and

(3) how these come together (the learning environment).

It is important that these three dimensions be completely integrated (Hopefenberg, Levin, & Associates, 1993). Students learn differently and draw on their personal styles, abilities, knowledge, and experiences as they explore new concepts. As a researcher there is little doubt that the methods of assessment used in science teaching at present simply encourage students to learn by rote. All students can have meaningful learning if teachers are enthusiastic learners themselves and stimulate an interest in their teaching.

6.3 Recommendations

Both the MESC and the NUS need to take a pro-active role to seriously address the quality of education for their pupils. This section is pertinent and is important because it suggests the following recommendations for educators and education sectors.

6.3.1 Ongoing Professional Development for Teachers

The field of education is guided by standards everywhere including Samoa. No matter where you teach, you will be expected to demonstrate competency in meeting certain standards. If the teacher wants to be knowledgeable about the subject, they have to look for challenges. This will probably mean extra time after school hours or during semester break. Most teachers who enter the teaching profession have very strong opinions about what good teaching is. In Samoa, all teachers go through teachers training at least for two years at the NUS (Western Samoa Education Strategies1995- 2005). The teachers indicated that they would like professional development to develop and master the skills and knowledge for conceptual understanding, and to use these concepts to develop clear connections across topics.

The education systems are experiencing constant change reflecting changes in society. However, teachers lack professional development opportunities for these changes to be a positive period of personal growth, rather it becomes a time of stress and feelings of inadequacy. Teachers need support to maintain an ongoing commitment to personal professional learning and to learn new teaching skills and methods during their professional development training program. Ultimately, for Samoa, like any other developing country, the education system is entrusted with the enormous but vital responsibility of producing a scientifically literate and qualified human resource. The challenge for us is to find ways to make our education system more effective by offering professional development courses.

6.3.2 Changes to Teach the "Test" Practice in Year 8 Classes

There are very clear goals in the MESC policies to provide a more effective education for all learners. In the formulation of these goals, the MESC had targeted a key concept namely 'quality' education for all the children in Samoa. With the Year 8 National Examination the tendency to teach to the "test" still remains because recall of facts is emphasised in the exams. Teachers find the pressure to cover all topics to be examined outweighs any opportunity or desire to focus on topics that may require extra work or are of interest to students. Furthermore, this style of examination-oriented teaching in Samoan classrooms allows little extension for able learners. Knowing the importance of such Year 8 National Examinations, teachers respond accordingly pressuring students to perform well in such examination techniques, but at considerable expense to their overall learning ability or development of higher order thinking skills. More traditional teacher-centred teaching and learning requires students to assimilate content based on the promise that students need to perform better in the examination. Instead of placing a lot of emphasis on passing examinations and rote learning everything, there should be more emphasis on meaningful learning which enables a student to have a well-rounded education. If MESC are serious about changing methods of teaching and learning in Samoa, then what is assessed needs to change. The New Zealand education system has undergone such a change in the shift to competency-based assessment where higher order thinking is valued alongside recall of factual material and interpretation. Teachers are more likely to align what they need to do when they realise that the assessment emphasis has changed.

6.3.3 Language Training for Teachers

The language of teaching and proficiency of teachers needs to be upgraded. More English language training materials must be provided not only at the primary and

secondary school levels, but also tertiary level where it is also needed for pre-service training. The selection of trainee teachers must be upgraded so that the quality of teachers who complete from NUS will be of a higher calibre. However, unfortunately there is no measure of teacher quality but, if National Examinations and SPELL results are considered an indicator, the quality of teachers in Samoa today, especially in reference to their English language proficiency, is still insufficient to meet the MESC bilingual policy standards. The recognised language difficulties amidst teachers can be addressed through in-service programs in collaboration with MESC and NUS.

6.3.4 Student-Centred Classroom Approaches with Adequate Resources

MESC needs to provide adequate resources especially print text books, reference books, multi media resources enabling teachers to use these resources and making all resources available for teaching and learning in all government schools. Student-centred learning is by its very nature, more resource intensive. Support is needed for teachers to implement such materials in the ways that the activities are intended.

Instruction must begin with close attention to students' ideas, knowledge, skills and attitudes which provide the base on which new learning builds. Being student-centred involves paying attention to students' backgrounds and cultural values, as well as to their abilities. Student-centred learning encourages students to apply what they know to novel situations. Teachers may want to know why these students need to learn so differently from the way they did. Each teacher brings a lifetime of experience as teacher and student, in a variety of schooling environments, to the present situation. Samoan children come to school from diverse backgrounds and it may not be possible to make classrooms as free and exciting as life at home but teachers can give more thought to the children's ways of learning and working with adequate resources in the classrooms.

Students can be encouraged to ask questions based on activity that can lead to further investigations.

6.4 Limitations

The limitations of this study are that the size of the research group was small and results from qualitative data may be limited. This implies the need for further research with a larger sample size and a combination of qualitative and quantitative analyses. There is a need to conduct future research to increase our understanding of effective science teaching practices in Samoa and the resources that support effective practice. It would also be useful to research how NUS courses and methods influence pre-service teachers in terms of their methods of teaching.

6.5 Problems Faced

I had some personal concerns borne out of my science teaching experiences with the trainees. I always had an intention to investigate what is lacking in teaching science in primary schools. The research topic and questions were drafted with focus on the use of PEMP books in science teaching. The main difficulty was in finding literature with similar studies already carried out by others in Samoa.

6.6 Personal Reflections

This section is a personal reflection that is based on the process that I had gone through in the writing of this research. I strongly believe that the “process” of doing research is equally if not more important than the final product itself. The skills and knowledge that I gained during the research process were valuable and worthwhile. I have learnt that there is a difference between teaching static science knowledge from a textbook and

teaching as hands on practice. The research interviews were undertaken face-to-face in the participants' environment enabled me to respect their cultural values. Although there were frustrations at times, overall I can say it was beneficial to my learning.

6.7 Concluding Remarks

This investigation of science teaching practices in Samoa has the potential to generate rich insights to guide improvements in the teaching of primary school science. In order to meet the demands of the today's changing world, teacher preparation programs will need to provide opportunities for beginning teachers to develop their awareness of the complexities that influence how teachers operate as professionals and make decisions. The question which is posed now is how to appropriately teach science. The best possible way to teach is to get the students excited about what they do and see and find out for themselves.

Samoa is going through changing times; traditions are being threatened by changes in society. Our societies are under pressure from external forces to shape up and modernize. This is leading to greater challenges now for our education system, especially teacher education. Modern courses emphasizing the nature, structure and the processes of enquiry that employ discovery investigations as the basis of science courses, can be included in the university courses.

A radical change is needed in the way teaching is done in Samoa. Teacher educators have an obligation to foster a new consciousness of culture in the programs they offer their trainees and to keep cultures and traditions alive. Teacher education courses are

expected to reflect the reality of the educational context and respond to the needs of the Samoan society.

Samoa has the appropriate education policies in place, we just lack their enforcement. The following statement in the Ministry of Education policies (MESC 2006 Strategic Policies and Plan) stated that what was needed in our education system was 'action'. The MESC and NUS need to take a pro-active role in seriously addressing the issue of teachers' methods of teaching science. Involving teachers in participating in the professional training and implementation through creating a positive environment for teachers can be an action by the MESC and NUS.

In conclusion the root cause for the problem may be related to teachers' beliefs about what to teach, how to teach and how students learn. An amalgam of factors affecting the implementation of any educational innovation includes characteristics of change, both local and external factors. I have taken up this research as a challenge with the hope that its findings and recommendations can be an encouragement to build upon further research in the area of science teaching methods in primary classrooms. Teachers in the 21st century need to be more aware of the holistic interactive, inductive nature of teaching. Our students must be immersed in an environment that develops and consolidates sound social skills as well as positive attitudes and values to enable them to develop as lifelong learners, able to thrive in rapidly changing world.

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APPENDIX 1: Ethical Approvals & Consent Forms

Please address all correspondence to the Chief Executive Officer

GOVERNMENT OF SAMOA
MINISTRY OF EDUCATION, SPORTS & CULTURE

PO Box 1869, Apia, SAMOA Telephone (0685) 21 911 Facsimile (0685) 21917 Email:samoamesc@lesamoa.net

26 May 2008

Mrs. Doris Varghese
Senior Lecturer
Faculty of Education
National University of Samoa
TO'OMATAGI

Re: ***"Science Teachers' Practices and the Use of Resource Materials in Teaching Science in Year 8 Classes"* Research**

Dear Doris,

Thank you for your proposal to conduct the above research. The Ministry has considered your proposal and has granted approval for you to conduct your research at [redacted] School, [redacted] and [redacted], with the hope that the results will be utilized to improve education in Samoa.

Please contact Lufilufi Taulealo, ACEO School Operations Division who will arrange your visits to schools.

Good luck with the research and looking forward to read your findings.

Sincerely

Tautapilimai Levaopolo Tupae Esera
CHIEF EXECUTIVE OFFICER

Please address all correspondence to the Chief Executive Officer

GOVERNMENT OF SAMOA
MINISTRY OF EDUCATION, SPORTS & CULTURE

PO Box 1869, Apia, SAMOA Telephone (0685) 21 911 Facsimile (0685) 21917 Email: samoamesc@lesamoa.net

RESEARCH AGREEMENT FORM

Research Title:
Science Teachers Practices and the use of Resources Materials in Teaching Science in year 8 cla

I Doris Varghese, agree to the conditions set by MESC as stated below.

CONDITIONS FOR RESEARCH

The conditions will include those particular to the research proposal and also that the researcher agrees to give an undertaking:

- to be ethical in undertaking the research
- to meet administrative and timing requirements of the schools and the ministry as set out by the Principal, and the MESC
- to meet timelines
- not to identify individuals (students/teachers/staff) in the report without specific approval from the CEO
- provide feedback to the MESC liaison person during the research
- to provide a copy of the completed research to the MESC
- that the MESC has the right to terminate the research at any time

Ministry of Education, Sports and Culture's ***Guidelines to Managing and Conducting Research*** *(p.3)*

I have read the conditions above and agree to abide by them during the course of the research.

I will also provide MESC with the final report of the study.

Researcher: (Print Name) DORIS VARGHESE Date: 23/05/08
(Sign) Doris V ghese

MESC Representative: Q Reid Date: 23/05/08
Quandolita Reid-Enari

"IA AO SAMOA"

LE IUNIVESITE AOAO O SAMOA (FAAVAEINA 1984)
NATIONAL UNIVERSITY OF SAMOA

Office of the Director
Centre for Samoan Studies

30th May 2008

Mrs Doris Varghese
Science Lecturer
Faculty of Education
Le Papaigalagala Campus

Dear Doris, Re: Request for Ethical Approval

I refer to your letter of 29th May concerning the above.

After going through your Ethical Approval Form, I am happy to inform you that you have satisfied the criteria as per the given checklist. You have also been given the 'green light' by MESC. You may now proceed to the next stage of your Masters Program research.

I wish you well in your endeavour with the two Government primary schools where you will conduct your research.

Sincerely,

Fonoti Lafita'i I. Fuata'i (Ph.D.)
Director
Centre for Samoan Studies.

Human Ethics Committee
Secretary
Tel: +64 3 364 2241, Fax: +64 3 364 2856, Email: human-ethics@canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HEC Ref: 2008/49/CoEdn

27 August 2008

Mrs Doris Varghese
National University of Samoa,
P O Box 2257
Apia
SAMOA

Dear Doris

The College of Education Ethical Clearance Committee is pleased to inform you that your research proposal "Science teachers' practices and the use of resource materials in teaching science in year 8 classes" has been granted ethical clearance at their meeting on 27 August 2008.

Please note that should circumstances relevant to this current application change you are required to reapply for clearance.

If you have any questions regarding this approval please let me know. We wish you well for your research.

Yours sincerely

Dr Missy Morton
Chair
Ethical Clearance Committee

"Please note that Ethical Approval and/or Clearance relates only to the ethical elements of the relationship between the researcher, research participants and other stakeholders. The granting of approval or clearance by the Ethical Clearance Committee should not be interpreted as comment on the methodology, legality, value or any other matters relating to this research."

Information Letter For Teachers

Dear _____

I am Doris Varghese a lecturer at the National University of Samoa. I am currently enrolled with the University of Canterbury for a Masters Programme. I am doing a research project this year for my Masters of Teaching and Learning degree. My intention is to collect some data so that we can examine what we need to include in our courses that are offered at the University to improve pedagogical content knowledge of teacher trainees. The methodology I will be using is semi-structured individual interviews, and student interviews and observation of classroom teaching using qualitative research methods.

I would like to observe while you teach science with a Year 8 class. The skill I will be looking at is mainly explanation i.e. whether the teacher uses different explanations to suit different circumstances. The questions that teachers use can raise additional questions that will encourage pupils' involvement and stimulate pupil thinking. I am also interested to find out what activities and resources you use for teaching science. I would like to observe at least two of your science lessons that is, two periods. I also require interviews with you for an hour. Questionnaires will be provided before hand. I will be using a tape recorder at our interviews. The time and date will be decided later closer to the time, it is likely that this may be beginning of 2008.

Everything you tell me will be totally confidential. Your names will not be used in any report that I write. I will be giving you a copy of what was said during the interview so that you can check for accuracy. All data will be kept in a file in my room in my house, and I am the only person who will have access to it. You are able to withdraw from the project or withdraw information you have provided at any time without penalty.

This research has been approved by the Ethics Committee of the University of Canterbury. If you are unhappy about anything that happens, please let me know, or you can contact the Ethics Committee.

Yours sincerely

Consent Form For Teachers

I understand that the research topic- **Science teachers practices and the use of PEMP and resource materials in teaching Year 8 classes.** I understand that the study involves two interviews with me and a classroom observation while I teach.

I understand that I will work closely with the researcher for this study.

I agree to participate in this study and I understand that I may withdraw at any time and that there will be no disadvantage to me if I do withdraw from this study.

I am aware that this study has been reviewed and approved by the University of Canterbury Ethics Committee and that I have any concerns about the content or conduct of this study I can contact the Ethics Committee.

The Chair

Human Ethics Committee

University of Canterbury

Christchurch, New Zealand

I agree that the research data gathered may be published.

APPENDIX 2: Consent For Participation In This Study

Name of Participant: _____

Participant's Signature: _____

Date; _____

I understand the aims and purpose of this study and the implications of participation

I give consent to participate and for the data to be used in publications.

Name of Researcher: Doris Varghese

Researcher's signature: _____

Date:

APPENDIX 3: Research Questionnaire

1. What is your teaching qualification?

Primary Teachers Certificate _____

Diploma in Education _____

Bachelor of Education_____

Others_____

2. What position or responsibility do you have in this school _____

Principal, First assistant, Senior Mistress, none

3. How long have you been teaching?

4. .How many years have you been teaching in Year 8?

5. How many years have you been teaching science in Year 8?

6. How many students do you have in this class of Year 8?

7. How many periods for science in a week for in a Year 8 class?

8. Tell me how you would describe what learning is.

9. Do you use PEMP materials in teaching science if so how do you use them?

10. How are they useful?

11. Do you have any ideas for how they could be used differently?

12. Do you still use scope and sequence in teaching science?

13. Do you have science practical kits in school? If so how often do students use them?

14. How do you find broadcasting materials/ useful/ not very useful?

15. Do you prefer to teach science in English or in Samoan?

16. How do you plan your science lessons?

17. When you write your lesson plans do you include the type of activity for that particular lesson?

18. Do you ask the students to carry out activities?

19. What type of assessment do you carry out in the class other than examinations and test? How does this influence what and how you teach science?